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EDITORIAL NOTES.

The American Gas Congress.

GRADUALLY we are obtaining the information which enables us to piece together, and form some intelligent appreciation as to the character of, the proceedings at the International Gas Congress at San Francisco, in connection with the Panama-Pacific Exposition. And we hope before long, through special descriptive articles, to bring our readers into closer touch, so far as it be possible, with the enthusiastic spirit which, there is no doubt, was a dominating feature. So far, we have given several abstracts of the papers presented on the occasion; and to-day we have the pleasure of publishing the addresses of the President of the Congress (Dr. Alexander C. Humphreys) and of the President of the American Gas Institute (Mr. E. C. Jones, of San Francisco). Dr. Humphreys was in the position of honour by right, as the recognized leader among American gas technicians. The gathering was international; but in representative *personnel* it was not completely so, owing to what the President described as the most "shockingly destructive and "horrifying war within the knowledge of man." However, as we have already seen, though the British gas profession was unrepresented in person, it was by papers.

Many sentiments—sympathetic and humane—fell, as would be expected by those who know him and his personal attributes, from the lips of Dr. Humphreys during his references to the events which have such current absorbing influence upon the mind of the whole world. We may reiterate whole-heartedly his hope that out of the sanguinary conflict there may finally issue some measure of compensating good for the peoples as a whole, and particularly greater security for those who are anxious to live at peace with their neighbours, and to exercise the right of working out their own destinies free from outside pressure and interference. We know that those in America of English tongue, and those of the tongues of our Allies, are full of belief in the righteousness of our cause; and although Dr. Humphreys' words were tactful, speaking in a land embracing the extremes of a composite population, the direction in which his personal sympathies lie is plain and gratifying. He recognized that, though the American nation is not immediately participating in the great conflict, it is involved in it through the ties of brotherhood. However, although America is not actually taking part, it is, we are pleased to know and gratefully acknowledge, doing much in the cause of relief for those who have been rendered destitute by the destruction of their homes and the over-running of their lands by the aggressors in this great conflict. It is also helping in the provision (as a matter of business) of financial loans; and its factories are busy making munitions of war for the Allies. But America is looking beyond the present. It is easy to see that the country will be a large beneficiary through the war. There is no blame attaching to America for this. The greater part of its enormous population would rather there had been no war, than that their country should benefit considerably from the appalling destruction. It is a duty that America, from its independent position, owes to itself and to the part of the world that must draw on its productive resources, that these resources should be developed to the utmost, or, at any rate, to the ultimate boundaries of need. Dr. Humphreys sees the belligerent nations incapable for years to come of fully meeting their own requirements in many directions; and therefore he looks upon it—in no mercenary spirit, but as a responsibility—that America should prepare itself to meet the demands that will be made upon it. In this preparation, the engineering profession will share, through its duty to work for the realization of greater efficiency in the operations of the several industries concerned, so that advantage may accrue not only to these industries, but to the countries which will be the purchasers. This was all happily put by Dr. Humphreys; and his words should find good ground not only among the manufacturers of America, but among those of this country who are at liberty to develop their concerns.

In the work of the present, and in that lying before, the gas industry must have a large part, as the suppliers of light, heat, and power. All three are essentials in practically every industry; and the cheapness of the agent supplying all three purposes is of the greatest moment. An agent so essential should have the fullest liberty to develop its service on the most economic lines; but, in the very land that boasts of its liberties, there has grown up a system of regulation by Commission of public utility companies—gas undertakings among them—which tends to cripple, rather than to foster, economic progress, and attempts are still being made to enlarge the powers of the Commissions. The responsible men directing the gas industry of America could do more to promote its service to the community and industries if there were not this throttling of their best endeavours. We can sympathize with them; for the British gas industry has had an experience of legislative trammels which have impeded advancement, but from which there has been of late years some relief, which enables greater freedom in the adoption and utilization of processes at the manufacturing end, with the result that more suitable gas and more B.Th.U. can be supplied for a given price than would have been the case if the Legislature had not been persuaded that over-rich gas was not necessarily the best for use in bunsen burners, and that the really intrinsically rich gas was that which gave the best results in use. Regulation up to a point is good; but it is a pity when regulation is carried to the length that it robs an industry of some of its potentiality in service efficiency. When this is the case, then regulation defeats its own true ends. The American gas industry, like the British gas industry, is confronted by strong electrical competition, guided by men of the highest attainments; and the industry cannot therefore afford to neglect opportunities for betterment through processes and development of its service. Without regulation, competition would keep the gas industry in the way it should go; for if it departed from the way that best suited its customers, the policy would be suicidal, and the end a certainty.

But in America, despite regulation, despite competition, the gas industry is not anticipating being deprived of any one branch of its business. We see this reflected in the confidence as to the future as expressed in the address of the President of the American Gas Institute. Mr. Jones said: "The future of the gas business looks very bright. We are "the purveyors of a commodity which has become a public "necessity, and before us lies a field of opportunities. We "are dealing with British thermal units; and with a know-"ledge of their application, gas should be pre-eminent where "heat, power, or illumination is needed in domestic and "industrial economy." This in America, with cheap electrical units! Mr. Jones also spoke of the unshaken belief of the gas men of America in the efficiency and economy of gas for all purposes being necessary in the permanent development of business. There are no doubts or fears there as to development of the gas industry not proceeding on all current lines of trading; and no suggestion has been made that it would be as well to define the respective territories of the gas and electrical industries, and let each industry work out its own salvation within that territory. There is among our American friends a robust faith in gas as an agent for illumination as well as for those purposes in which electrical competition is of a weakly order; and there is no talk among them of doing ought else than use every effort to develop all lines of business, and not to relinquish anything without a struggle.

There is one other matter in Dr. Humphreys' address of which members of our own Institutions and Associations might well take heed. It is the point that he makes as to the responsibility of men who take part in discussions at

technical meetings. He is convinced that the responsibility is not sufficiently recognized. Speakers appear to forget that the audience before whom they are speaking is numerically small compared with the subsequent world-wide readers of their remarks, who will be making judgment of the man who made them, and of his information on the subject, through the published reports in the technical papers. Discussions are often inadequate; the remarks of the speakers are frequently irrelevant, misleading, and futile; they may be complimentary, but they do not subscribe to knowledge. In discussions what is wanted is that more men should rise to their feet who can contribute something of value; and the windbags should recognize their own character and deficiencies, and appreciate that, in these times of requisite higher economy and greater efficiency, they would be contributing more value to the discussions by suppressing their own verbosity and remaining silent. In discussions, as in all else, let us be, as Dr. Humphreys exhorts, diligent and painstaking. Then the technical proceedings of our organizations will be of greater worth; and through them there will be developed "the truth, the whole "truth, and nothing but the truth." This is what should be the objective, and its attainment will make for progress, and that more rapidly.

A Last Message.

THERE is always something that stirs up one's inmost feelings on reading his last writings after a man has passed direct from active life into the great unknown. It is so in the case of the preface that Mr. Edward Allen, just before his death, penned to the British contribution to the proceedings of the great Gas Congress which has been held at San Francisco—describing gas practices on this side. We publish the preface in another column. The words and the turn of every phrase speak of Mr. Allen. The courteous apology for inability to redeem the promise made to visit San Francisco for the Congress, the hope that the proceedings at the Congress would reach the highest level of expectation, the note of respect and admiration for the American Gas Institute, the acknowledgment of the indebtedness of the gas industry universally to American gas engineers for their contributions to its advancement, while at the same time not overlooking the British title to recognition for what the home gas profession has done in the same direction—Mr. Allen's hand is in it all. Throughout the preface there is the recognition of universal co-operation in the technical work of the gas industry; and this is to the good and prosperity of the gas industry throughout the world. Nothing could have been better phrased as a last message to American *confrères* by the representative of the British gas profession who contemplated the long journey to San Francisco (but was called upon to take another and final one) than this passage: "The bond of friendship and good-"will that unites the gas industries of this country and your "great Continent is growing stronger year by year and "shares a part in the union between our countries that is "highly valued and appreciated at the present time, and "that shall never be broken." The members of the American and British gas professions will be at one in endorsing these words.

Value from Waste.

THERE are very good grounds for hope that the address of Professor William A. Bone, D.Sc., F.R.S., to Section B (Chemistry) of the British Association will result in a movement with the view of urging upon the attention of the Government the need, in the economic interests of the country, of doing something to stem the waste of coal and its valuable components that is rife both in industry and in the household. It is very desirable that the Council of the British Association should set up a Committee to consider the matter. If this is done, an important initial step will have been taken towards focussing public and scientific opinion on the question, and of, in the near future, making very strong representation to the Government. The idea of appointing such a Committee was influentially supported at the Manchester meeting of the Association. This is satisfactory; and we hope the result will be even more so.

One of the illustrations with which Professor Bone emphasized the waste of coal that is proceeding was provided by the beehive coke-oven, which stands as perhaps one of the most hideous of monuments to the slackness in some quarters of individual effort in the promotion of economy. Proving the slackness and waste of the one type of plant are the results from the other type—the bye-product coke-oven; and yet the owners of the beehive ovens calmly continue to operate their old plant while fully aware that savings in expenditure and considerably larger profits are to be realized by turning from the older to the newer order of operation. The "Iron and Coal Trades Review" estimates that, if the 6,600,000 tons of coal carbonized in beehive ovens were treated in bye-product ovens, 4,700,000 tons of coal would amply suffice to produce the same quantity of coke, which means a saving of about 2 million tons of coal. If, too, the 4,700,000 tons were carbonized in bye-product coke-ovens, there would be an additional supply of 188,000 tons of tar, 58,700 tons of sulphate of ammonia, 11,750,000 gallons of crude benzol, and 23,500 million cubic feet of gas. Certain of the computations may err somewhat on the high side. For instance, from 13½ million tons of coal carbonized in bye-product ovens in 1913, Professor Bone pointed out, the yield of ammonium sulphate was 133,816 tons—equivalent to an average of 22·4 lbs. per ton of coal, while the "Review" has evidently taken an all-round production of 28 lbs. per ton. The calculations of our contemporary are made on the best standards of working, but are near enough to impress the point it desired to make. Of course, change from beehive to bye-product working is not, commercially regarded, to the advantage of the gas industry, whose interests would lie in the direction of curtailing the supply of the products from coking plants, and of seeing these worked in the most wasteful manner. But the gas industry has never adopted such a foolish attitude as to object to other industries doing what it is continually striving to do itself—attain to greater economy in working, and therefore to greater profit from every ton of coal carbonized, to the advantage both of itself and its gas consumers. To object would be not only futile, but would suggest a disordered mind.

However, the perusal of our contemporaries devoted to colliery interests shows that here and there men are directing the attention of the owners of coking plants to the waste that is proceeding. That all the bye-product coke plants are not working up to the highest standards achieved by some (as is shown by the fact that the yields are not consistently on the scale of the ones which served the "Review" as a basis for calculation) is confirmation of the point made by Professor Bone in his address, that there is deficiency in connection with some plants of efficient chemical control and supervision, and upkeep. There are losses in heat, gas, tar, and ammonia, and an indifference to the conditions approved by skilled men for obtaining the highest yields of bye-products having regard to the realization of a good quality coke. The fact is that bye-product working, which is excellent in some places, wants thoroughly overhauling in others. If there is going to be any closer business connection with the gas industry, in supplying gas for town purposes, it would most probably be a good thing to study the question of the temperatures at which coking proceeds in relation to gas quality, and tar, benzol, and ammonia yields, and to see what would be the verdict of the balance-sheet, though it might reduce the coke-producing capacity of the ovens somewhat, to come down to the most suitable temperature for the gas and other secondary products. But diminished wear and tear on the ovens, the utilization of low-grade material in the producers (with bye-product recovery) for obtaining gas for heating the ovens, and the additional revenue from the higher yields of bye-products from the ovens, might make the balance-sheet very tempting. But this all asks for some proper chemical control and supervision.

The charge of want of economy in the coking and mining industries is very freely expressed in the coal journals as well as in papers read before the technical societies; and it seems that the suppression of this condition requires some strong action from without to supplement the spasmodic and not very effectual efforts from within. We have referred to the utilization, for the heating of coke-ovens, of producer gas made from inferior coal, with bye-product recovery, as one direction in which there is possible economy. This was one of the features of Mr. W. Chaney's paper before the Institution of Gas Engineers in 1913, describing the coke-oven installation at the Saltley Gas-Works at Birmingham. The subject was specifically dealt with by Mr. M. H. Mills, in a paper read before the Institution of Mining Engineers at Leeds [see "JOURNAL," Sept. 21, p. 640]. Now that gas-producers have been developed to such a state of efficient working that good types can be obtained to gasify almost any class of fuel—even fuel containing as much as 50 per cent. of

ash, which, under ordinary conditions of combustion, would go to form clinker—a new field of economy is presented. As Mr. Mills points out, a large quantity of low-grade fuel is now lost. In many cases where the coal at the top and bottom of seams is inferior in quality, it is left in the mine; but if this can be gasified, as well as other material that is sent to the tips, and the gas be used for heating and power purposes, then there is waste in rejecting it. Of course, it costs as much to raise inferior coal as good coal; and the coalowner, looking for the largest possible profits, prefers to send up from his pits the best saleable sort. Mr. Mills, however, argues that every ton of the hitherto unsaleable coal gasified in producers means a saving of ½ ton of good coal. It is not right, in the interests of the country and the future, that mines should be operated in a wasteful manner as though there was no end to our mineral wealth and resources.

In addition to the heating of coke-ovens, there is a large field for producer gas in industries where heat and power are required on a scale that cannot be economically dealt with by the gas industry. To get our largest manufacturers, however, into the gaseous fuel vogue through producer gas must operate to the advantage of gas undertakings in those urban industries where heat and power on a smaller scale are required. Mr. Mills referred to the use of producer gas in the steel industry; but, as pointed out in Professor Bone's address, it has been demonstrated as possible to produce finished steel sections (rails, plates, girders, &c.), from a low grade iron ore, such as the Cleveland ore, with no further expenditure of coal than that which must be charged into a bye-product coke-oven to produce the coke required by the blast-furnace. Not another ounce of fuel of any kind is needed; and a gas-producer (other than the coking plant and the blast-furnace) on a steel works is quite unnecessary, except, perhaps, as a stand-by in case of accident. This would apply to the whole output of ordinary structural steel. Of course, the question of the production of special high-grade steel (such as in the Sheffield trade), where complex heat treatment is required, stands in a different category. However, the facts in Mr. Mills's paper are of general importance, and not uninteresting to the gas industry, the whole future of which, with swelling competition, rests upon economical production and the making of the utmost of its products, through the best of methods and standards of quality. These are days of reorganization, of economy, and of topmost yields.

The Public and Exact Definition.

It is possible to be too precise under certain conditions; and one such condition is found in the heterogeneous mass which we call the community. In giving instructions to, or in imposing regulations governing action upon, the community, it is necessary that they be couched in such general terms that all who read will understand. But there are some ultraists who would have everything strictly defined in scientific language and quantities, which would only produce unbounded confusion. It is necessary for those who give instructions and make regulations to appreciate the difficulty of dealing with people the majority of whom know nothing whatever about scientific laws and determinations, and to render their instructions and regulations in a way that will produce the maximum effect in the direction desired. For example, how many of the millions of people who constitute the population of the Metropolis understand anything of foot-candles, and would comprehend what was meant if authority decreed that the maximum illumination thrown on to the street pavement from the windows of a shop or dwelling-house should only be some fraction of a foot-candle?

Yet there are grumblers over the new lighting regulations that have been brought into force in London. For these people, they are not sufficiently scientific or determinate. It is left too much to the individual understanding to say what such and such a term means. Yet within a week, the population of London have willingly complied with the new regulations in such a way that London in its shopping, business, and residential quarters is not what it was; and the authorities are pleasantly surprised to find that there is little of which they have had occasion to complain—in fact, now that they have seen what shopkeepers and householders can do in diminishing the illumination in the streets from irregularly used interior light sources, they are making arrangements for an increase on uniform lines from the public lamps which are not subject to the same variations as are the private lights. Scientific rule and regulation would have meant an army of scientifically trained inspectors, which we have not available for the work. The intensity of illumination, in connection with private premises, must be left as things are to the reasonable judgment of those who are responsible for the provision of the illumination, and those in whose hands control is placed. If there is dispute, then there could be reference to some independent qualified person.

Notwithstanding that London has now before it the result of a very intelligent appreciation of the new regulations, "Electrical Industries" speaks of them as "another official "rigmarole," which will throw "the trading community "and the householder into fresh confusion," which is just what has not happened. It would have had something more scientifically definite. It instances the regulation that "the intensity of the inside lighting of shops and shop "fronts must be reduced so that no more than a subdued "light is cast in any direction outside the premises." What, it asks, is a "subdued" light? Shopkeepers generally have given a very practical answer by what they have done; though we should be better pleased to have seen the subduing accomplished, in some cases, in a less crude fashion. Again, "all large lighted roof areas must be covered over, "or the lighting intensity be reduced to a minimum." What is the "minimum"? Our friends are hypercritical. The minimum could not be defined. It would be one thing from one set of conditions and another thing from another set. The maximum only could have been stated; and if shopkeepers and householders had been told that the maximum illumination allowed on the pavement from their private light sources would be 0·01 foot-candle, they would have been no better informed than before, and confusion would have been so great that the authorities would have been plagued almost out of their lives for instruction as to how the measurement could be effected, to decide whether the "maximum" was down to the numerically defined quantity. Again, "the lighting of railway stations, sidings, and goods "yards must be reduced to the intensity sufficient for the "safe conduct of business." Our contemporary here asks: "How is the railway company to know when it has struck "the happy medium which the Commissioners of Police of "the Metropolis and of the City of London consider suit-"able for the purposes of the Admiralty?" We put the converse question: How are the authorities to define "an "intensity sufficient for the safe conduct of business," unless they know all the conditions, and the ever-varying nature of the business proceeding in places such as those named? If it were possible to define generally the illumination for all such positions, the work of the illuminating engineer would be of a very thin order.

However, the regulations, which have been so well interpreted by the unscientific public, are considered too vague by our grumbling contemporary; and it is submitted that it would have been a very simple matter to have defined permissible illumination. Granted. The difficulty would have been to have got the public to appreciate what was meant; and ignorance of scientific terms and quantities, and incapacity for making measurements, would have been valid excuses for non-compliance. The authorities evidently appreciate the public better than the sticklers for mathematical precision; and by the result the authorities have proved themselves right.

French Gas Men and the War.

The French gas industry has had its problems, its difficulties, and its obligations, owing to the war, the same as, and in some respects more so than, the British gas industry. We get, through the report of the useful French Gas Professional Syndicate published this week, an insight into some of the pressing troubles and work that have arisen from the war. The Syndicate, we venture to say, has never been in the position to render such splendid and effective service to the French gas industry and the nation as it has accomplished during the period since war caused greater upheaval in France than here. In most practical manner, it has pursued the special work that came to its hand through the war. It not only inquired, and provided valuable intelligence, but it acted and helped, through the English coal markets, to obtain coal and secure its better distribution. Supplies and prices, transit and freight—all the same problems as

here have been France's. The work regarding coal that has been done, and successfully, in this country by the gas industry, we are happy to feel, has been of benefit to our colleagues in France. The coal situation is now easier here than it was but a few months ago; and coal stocks are assuming quite respectable proportions. This being so, our French colleagues may take it for granted that their opportunities for making contracts for British coal are brighter to-day than they have been at any time during recent months. France, we know, must have coal at any price; but the correctness of the view that the easing of conditions in this country is having good effect there is shown by the large coal exports that have been recently made to France. As to sulphate of ammonia, tar, high explosives, and dyes, conditions have, in each and every respect, semblance with those obtaining here.

Costs for Handling Material.

Scattered here and there through the columns of the "JOURNAL" are to be found particulars as to costs of handling material by new plant representing the latest approved types. It would be of value if these particulars were more frequently supplied for publication, with a full explanation as to the character of the plant and the work done. Without such information, there is not much use giving cost data, as these must vary with different circumstances. In another part of the "JOURNAL" to-day, there appears a description, by M. Viktor Schön, of the coal and coke conveying plant at the Obuda Gas-Works at Budapest; and under the conditions there described, he shows that for tipping a 20-ton waggon, two men and 0·46 unit of electrical energy are required. The cost of this part of the work is 2·1d. per waggon, or 0·1d. per ton. This low result could not be realized with smaller waggons, or with more intermittent working. Breaking, elevating, and conveying the coal to the bunkers over the retort benches—the height to which the coal is raised being 82 feet—require three men and 36 kilowatts per hour—the cost working out to 0·43d. per ton. These two items make the low expenditure of 0·53d. per ton from tipping to deposit in the overhead bunkers. It is evident from this that the electrical energy works out at an extraordinarily low rate. A more serious business is the putting of the coal into store and taking it out again; the cost being 0·9d. for each operation per ton, or 1·8d. for the two. While eleven men are required for the work of storing, thirteen are needed for removing the coal from store, and conveying it to the place where it is to be carbonized. The consumption of electrical energy is rather less for the removal than for the storage, but, as seen, the number of men is more. To ascertain the nature of the plant by which these low costs are achieved, the interesting article must be read.

Collieries and Gas Coal Contracts.

The "Iron and Coal Trades Review," in their last issue, had an editorial article on the "Price of Coal (Limitation) Act," in which there are a few statements affecting gas undertakings which are based upon misinformation. In the first place, we see that the benevolent rulers in the coal industry are men who are very loth to engage in litigation; and the result is that many amicable settlements have been made on a basis considered by both parties to be as satisfactory as possible in the circumstances. Respecting the retrospective provision of the Act, notice of a wish to come under its provisions was to be given before the end of last month. Our contemporary states that it is "said that some, if not all, of the gas companies have resolved to abide by their compacts; the price to which gas has now been advanced, and the upward course of the market for residuals, having placed them in a very comfortable position financially." We should advise our contemporary to study the prices of gas stocks now and before the war, together with the dividends paid per cent.—not the return that would be received on an investment made at the prices now quoted for gas stocks. The gas industry has largely to thank the colliery owners and coal shippers for the high price of gas, the low dividends, and the present financial position. Not all gas undertakings have been able to make both ends meet on the first increase in price; and not a few have had to make a second advance. The article goes on to say that one speaker explained at a recent conference of gas engineers that gas companies regard the new Act with mixed feelings, as it has robbed the coal market of elasticity. Unfortunately for the "Review," this speaker did not represent the views of the gas industry generally; and he stands in a somewhat isolated position.

Discontent and Interpretation.

If the "Review" takes note of the report of the proceedings at the Wales and Monmouthshire Institution of Gas Engineers [see last week's issue], it will find there is a good deal of discontent among gas undertakings with the attitude of the colliery owners in connection with the Act. The dissatisfaction is not to be found only in Wales and the adjoining counties, but in other parts of England. It was through this, and the attempts of the coalowners to place obvious misinterpretations on the provisions of the Act in order, if possible, to secure additional advantage for themselves, that the Lancashire Commercial Section of the Manchester Institution of Gas Engineers approached the Board of Trade with the view of obtaining from them an opinion as to the construction to be placed upon certain clauses. The opinion [as seen in last week's "JOURNAL"] was diametrically opposed to the views of certain coalowners, and in favour of those of the gas undertakings. Lawyers who have considered the matter, on the cases submitted to them by colliery owners, have given opinions strangely, as a rule, coinciding with the desires of the colliery people. But after all the Board of Trade were responsible for the Act; they know what were their own intentions; and the final tribunal in the matter happens to be the Board, seeing that to the Board reference can be made by a Court of Law under any set of circumstances. We are glad the "Coal and Iron Trades Review" came across the interpretations of the Board in time to incorporate them as the final paragraph of their editorial, as they indicate (or rather would have done to readers of the "Review" if our contemporary had mentioned that the matter was referred to the Board of Trade by an organization connected with the gas industry) that gas undertakings are not altogether contented with the arrangements on which colliery owners would have preferred to settle differences, and that the colliery owners have wasted both time and money in taking Counsels' opinions, which they could use as a lever in gaining their own ends.

The Dyers' Grumble.

It is impossible to please everybody; and it is really no use trying. Every Britisher in the exercise of his prerogative, will grumble. Mr. Lennox Bertram Lee, the Chairman of the Calico Printers' Association, has been exercising his right at the annual meeting of that body. He has had his say; and nobody will be one penny the worse, nor will see that he has any substantial grounds for grievance. His complaint has to do with British Dyes, Limited, and with the Government having made a considerable investment in connection with the concern. Mr. Lee's opinion appears to be that, because the Government supported, by a large sum of money, the scheme for helping to save from starvation the opulent industries requiring dyes and colours, the result in dyes and colours should be open without hindrance to all purchasers. The logical conclusion of this is that those who did not co-operate financially with the Government should have equal rights with those who did—that is to say, that those who nearly succeeded in wrecking the scheme by standing aloof financially should now have par-purchasing rights with those who assisted the Government to float the scheme. We cannot see the equity of this. The trouble that touches home with the Calico Printers' Association is that, though one of the largest consumers of dyes in this country, they only bought 5000 shares in British Dyes, Limited; and now that the shareholders are receiving dyes in proportion to their holdings in the Company (which holdings should in a co-operative scheme have borne some relation to their position as consumers), the Association are greatly aggrieved and apparently much perturbed over the situation. If the largest backers of the scheme did not receive greater consideration than those who did not subscribe at all and those who did not subscribe according to their position, then a very real injustice would be done—an injustice which we should be better prepared to censure than we are to support the plaint of Mr. Lee, which has no substantial reason in it.

Progress of Trade Union Membership.

Since 1913 so much has happened that there is just now but little inclination—and in many cases little usefulness in doing so—to study conditions existing at that time, which under more ordinary circumstances would have claimed a considerable share of attention. Government statistics are always apt to be placed before the public in the shape of Blue-Books after a lapse of time

which has robbed them of much of their interest, if not of their actual value. But it is necessary to make the best of them when they do come; and even though more than fourteen months of the war have intervened between the period to which the figures refer and the present date the significance of the contents of the report on trade unions for 1913, of the Chief Registrar of Friendly Societies, makes it worthy of note. From the report, it is learnt that the outstanding feature of registered trade unionism in the year with which it deals was the remarkable increase in membership, which is generally attributed to extended propaganda work and improved organization during a period of great industrial unrest. As a matter of fact, the membership of the 655 trade unions making returns in 1913 was 3,264,669, which showed the extraordinary increase of nearly three-quarters of a million as compared with the previous year—an increase which is by far the largest recorded in the history of registered trade unions. When seeking an explanation for this great display of activity, it was at first thought some unions might have included in their membership a number of members joining for State insurance purposes only. Inquiry proved that this was not the case, although the possibility is admitted that the influx of new members owing to the National Insurance Act which occurred in 1912 still continued to some extent during the following year. Among others enjoying this fuller measure of prosperity, the National Union of Gas Workers and General Labourers of Great Britain and Ireland, we are told, continued its rapid growth of recent years. During 1911 its membership, which for some years had been slightly over 30,000, rose to 77,000. In the following year, it reached 82,000; and at the end of 1913 it stood at nearly 135,000. Though the average contribution per member of a trade union was 6½d. per week, the total income was nearly £4,600,000; while the expenditure was only £3,700,000. This enabled a substantial sum to be added to the funds [which had been sadly depleted by the great coal strike in the preceding year], bringing them up to over £6,500,000, or roughly speaking £2 per member.

THE LATE MR. EDWARD ALLEN AND THE AMERICAN GAS CONGRESS.

A Posthumous Contribution to Gas Literature.

Readers may be reminded that last Spring it had been arranged that Mr. Allen (accompanied by his wife) should attend the International Gas Congress at San Francisco as a representative of the Institution of Gas Engineers; and he made himself responsible for securing contributions from representative gas engineers in England under the inclusive title of "A Review of the Present Practices in the Manufacture and Distribution of Gas by British Undertakings." Unfortunately, the European war and Mr. Allen's death in July prevented the idea being fully realized; but he had at the time secured four of the five papers to be included in the projected "Symposium," and had himself written the "Introduction." This appears in the pamphlet issued in connection with the meeting; and it will be interesting to reproduce it in full, as the last of many contributions he made to technical literature. It is as follows:

In offering the following series of papers, it is a matter of great regret that I am unable to attend the congress to be held at San Francisco in September.

The invitation given to the Institution of Gas Engineers at the annual meeting held in Liverpool in June of last year to send a representative, was highly appreciated by the members, and the choice fell upon the President at that time.

Dr. Elliott was the American representative, and gave a very kind and hearty invitation to all the members who might be able to visit San Francisco; and he was good enough to invite me and my wife to be his guests at New York before making the journey to the congress.

Unfortunately, the great war which commenced early last August has made it impossible for me to keep my promise; and I earnestly beg to be excused under the unforeseen circumstances that have arisen.

It is my duty and privilege, on behalf of our Institution, to present a resolution of profound respect and admiration for your great Institution, and the hope that the proceedings at San Francisco will realize your highest expectations.

The bond of friendship and goodwill that unites the gas industries of this country and your great Continent is growing stronger year by year, and shares a part in the union between our countries that is highly valued and appreciated at the present time and that shall never be broken.

In my position as Engineer to the Liverpool Gas Company, I feel a special interest in the gas industry of the United States of America. The port of Liverpool is closely connected with your country, as the usual place of arrival and departure of American visitors.

In my early days, the gas engineers visited our offices and works; and I retain clear memories of General Roome and the Greenoughs (father and son) visiting the late Mr. Alfred King and my esteemed predecessor, Mr. William King. Since that time there is a long list of distinguished gas engineers who have been honoured visitors to our shores.

It would be difficult to fully describe the benefits received in our industry from American engineers. Contributions have been made to the annual meetings of our Institution by your members during past years, to our great advantage.

No doubt the early installations of coal-gas plant in America were copies of those in England at that time; but a corresponding course was followed in this country in regard to carburetted water-gas installations when the plant made perfect by the United Gas Improvement Company, of New York, was introduced more than twenty years ago by Dr. Humphreys and Mr. Glasgow, to the great advantage of many undertakings. It is interesting to note that the first order was given by the Liverpool Gas Company, and the plant set to work early in 1895.

It is a matter of great satisfaction that in each country full information is given about all new plant and machinery on gas-works; also of all improvements made in old apparatus and processes of manufacture and distribution.

Your National Commercial Gas Association and the British Commercial Gas Association are running on similar lines; and there are many members with joint interests in these two important organizations.

The series of papers now submitted to the conference is not intended to present novel features, but is a review of the usual practice in this country which it is hoped will be interesting to our American colleagues. The author of each paper is a recognized authority on the subject dealt with, and is respectfully presented to this great assembly of American engineers.

I have the honour to be, &c.,

EDWARD ALLEN, M.Inst.C.E.,
Past-President of the Institution of Gas Engineers.

Of the series of papers referred to above, abstracts of those by Dr. W. B. Davidson, Mr. J. Ferguson Bell, Mr. Walter Hole, and Mr. F. W. Goodenough were published in the "JOURNAL" for Sept. 28, pp. 699-701. The other paper intended to be included in the "Symposium"—that by Mr. John Bond, on "Carbonization"—was not sent forward for the Congress. Mr. Bond explains that he found it was impossible to do justice to the subject in the time at his disposal. As most of our readers know Mr. Bond has now for many months past been fully occupied on toluol extraction—more especially of late, since he undertook the work which Mr. Allen had in hand at the time of his death.

Cablegram to the Institution of Gas Engineers.

In connection with the above, the following cablegram was received last Tuesday by Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers:—

> Greetings from California. By resolution, the International Gas Congress thank the Institution for Symposium on "Gas Manufacture and Distribution," and wish you to convey to Mrs. Allen our sense of obligation and personal sympathy. We cordially reciprocate sentiments expressed in the last paragraph of Mr. Goodenough's paper.
>
> ALEX. C. HUMPHREYS, President.
> GEORGE G. RAMSDELL, Secretary.

The last paragraph of Mr. Goodenough's paper here referred to reads as follows:—

> If our review of what has been and what needs to be done leads us to a firmer conviction that, above all, our policy must be sound from top to bottom, broad based upon the principle of efficient service, and to a clearer vision of how that policy may best be pursued, we shall have usefully spent our time, and will go forward to greater success than we have yet achieved. Progressive ideas are spreading rapidly in the gas industry on both sides of the ocean. The National [might it not be now called the American?] Commercial Gas Association has done a great work in that land of progress towards which in these times of stress we more than ever look for co-operation and comradeship. The British Commercial Gas Association is doing its best to forward the cause of efficiency in [may we still call it?] the Mother Country and her overseas dominions. May we long go forward side by side, mutually stimulating and encouraging each other, believing with Robert Louis Stevenson that "an aspiration is a joy for ever, a possession as solid as a landed estate, a fortune we can never exhaust, and which gives us year by year a revenue of pleasurable activity," and so travel hopefully together towards the unattainable ideal of perfection, in the service of the public and of the great industry in which we are engaged.

ELECTRICITY SUPPLY MEMORANDA.

We are all viewing the incidences, individually and industrially of the Budget in the most philosophic spirit as being among the things that cannot be avoided, and so must be endured. What we have to do is to exert ourselves to make as many 18s. (or thereabouts), 17s., or 16s. 6d. in the pound as we can; and this can only be done by pursuing business to the full extent of our power, and that "full extent" is not by forsaking any of the methods of promoting business. The more pounds that can be made, the better individually and for the country. Besides, there is always a hereafter; and the hereafter will not benefit by cutting ourselves adrift in the present. However, there are not many among us who can detect anything in the Budget over which to be really jubilant. We congratulate "Meteor" of the "Electrical Times" upon finding something in Mr. M'Kenna's proposals over which to be so. The electrical industry has been very busy in the past helping—by good orders for electrical plant, lamps, and other appliances, and by supporting German capitalized companies in this country—to finance Germany, and to strengthen it for carrying on war against this and other countries. All the orders that have gone to Germany which could have been avoided have been so much the worse for this country. "Meteor" sees in the adoption of protection as a temporary war expedient the beginning of something that will probably be more permanent. If so, and the range of things on which import duties are placed is increased, the range may reach electrical apparatus and appliances, so that the home producing industries may profit. Now our political and financial monitors advise us that what the country must do is to reduce its imports as far as it can conveniently do so, and increase its exports to the greatest possible degree. If this is good procedure for war times, it is good for peace times. There is no possible evasion of this fact. But, despite the counsel of high authority, "Meteor" is grieved to find that orders for electrical plant and goods are still going abroad. Patriotism ought surely to prevent this being so; and he thinks that what persuasion will not do, a 33⅓ per cent. impost would effect. We are only at the parting of the ways in this matter; and our friend believes that the ways will diverge more and more. If motor-cars, why not electrical plant and other goods? "Meteor" feels hopeful; and British electrical plant manufacturers are hopeful with him.

Budget and Business.

Eliminating Dear Fuel Costs by Higher Efficiency.

Advisers of the electricity supply industry are generally of the optimistic order. Everything is plain sailing. The managers of the industry have only to say "do," and it is done. It must be nice to be able to command, and to know that the issue of the command is an assurance of fulfilment. If this were not fancy but reality, the electricity undertakings of the country would all be healthy and wealthy, instead of as many of them are to-day strugglers with very adverse conditions. An "Engineering Correspondent" of "The Times Engineering Supplement" has been writing on "Electric Supply Policy and Commercial Prospects." If his policy is followed, there need be (according to his writing) no more heavy hearts among central station engineers and managers, but all will be well and bright. There is dear fuel to-day. Well, dear fuel can be laughed at; for have not steam-turbines the past few years largely discounted the influence of fuel cost upon general policy? There is a large quantity of plant in existence which will not bear comparison with what manufacturers can now produce; but as soon as the Treasury is kind enough to sanction expenditure, there will be a brisk demand for high pressure and mixed pressure turbines. Then the aggregate saving in coal consumption resulting from a general movement of reorganization will reach very high figures; and so "Engineering Correspondent" is confident that sooner or later plant efficiency will defeat dear coal, and will enable the managers of generating-stations to ignore this consideration in connection with their plans for pushing business. It sounds almost like a fairy tale. Fancy being in the position to ignore dear coal! The prospect is too good. But central station engineers with practical facts facing them on all sides will not be disposed to accept the imaginings of such an adviser. Engine efficiency is not the sole factor in low costs. Demand is a factor; and so is the nature of the demand. Another thing is that it depends on the amount of work the steam-turbine has to do whether it is a cheap prime mover. There are other power agents that are equally cheap for low horse powers. Another matter that the central station engineer has to consider is the question of capital. Capital expenditure already incurred cannot be pitched on to the scrap-heap without very serious consideration by many electrical engineers to-day. It is not sufficient that fresh plant comes along that is more efficient than the plant in existence. The efficiency must be such that it will produce economies that will pay interest and liquidate the outlay on the discarded plant, as well as perform the same service on its own behalf. Unless it can do this under the conditions of a concern, then there would not be economy in effecting the change.

At the Trading End.

From the efficiency question, "Engineering Correspondent" passes on to consider commercial policy. While the manufacturers are blessing the central station engineer with more economical machinery, their market is being disturbed by more economical appliances being supplied at the consumer's end of the cable—thus restricting demand, and so limiting the field for generating plant. "Engineering Correspondent" does not say anything about plant efficiency not compensating, through lower generating costs, for the loss of consumption. He thinks that current sold by meter for lighting will have to be priced at a higher rate, or a large addition to the number of consumers must be secured. We have heard these ingenious proposals before. But the central station engineer looks at the price being charged for gas, thinks in B.Th.U., and pauses before recommending an increase in the price of electrical current. And as to the increase in consumers—well "must" is a very strong word to precede "be secured." The securing, too, is very difficult; and the difficulty becomes greater with experience. In the course of our travels, we met a man the other day who has had the electric light turned out of his living rooms, because the whole of the members of his family said they could not see print so well by its aid as they could do by the help of a neighbour's inverted incandescent gas-lights. And the neighbour with the incandescent gas-lights will not change over to electricity because of the experience in the electrically lighted house of his neighbour. Another neighbour who used to be somewhat extravagant with electric-radiators states that he is exercising economy by using a coal fire in his morning room, and a gas-fire in his dining-room, because now that the novelty of the electric "heaters" has expended itself, the members of his family assert that they are frauds. As to domestic electric cooking, the more experience there is of its shortcomings and inadaptability to all requirements, the less likelihood is there of any permanence in the use of the process. Progress with it is extremely slow even in the districts of the most persevering electrical men. However, "Engineering Correspondent" thinks a flexible tariff—we suppose he refers to something in the way of the rateable-value-*cum*-point-five system of charging—would be the thing to override all difficulties. Evidently, he believes that some electricity concerns by putting up their electricity charges, owing to high-fuel costs, by 10, 12½, or 15 per cent., have gone beyond what is necessary, because he advises that where such increases bring in sums that are more than sufficient to balance the greater cost of production, the extra profit made should be earmarked for use as working capital, "particularly for application to the business of letting out domestic apparatus like cookers or vacuum cleaners, the initial cost of which limits their use in middle-class houses." Most electric undertakings will want all the extra revenue arising from the addition to their prices.

Indefiniteness.

We have read the first part of an article in the "Electrical Review" on "The Problem of the 'Point-Five' Tariff." Such articles are read because one is fond of exploring writings of the kind to ascertain whether, by any mischance, there is something new in them. If there is, it ought not to be overlooked by us. This first instalment of the article does not contain anything very new; and the writer does not appear to be quite certain of himself or his points, as only in the first column he uses the expression "seems" or "seem" no less than five times: "It *seems* no overstatement of the case to say that really important development in domestic heating and cooking depends on energy being available at 0·5d. per unit (or less);" "heating and cooking apparatus *seems* at last to be emerging on a commercially and technically satisfactory basis;" "it *seems* quite certain that a uniform flat-rate can only be justified by practically a 100 per cent. station load factor, since no improvement in storage cells can make the storage of electrical energy as simple, cheap, and efficient as the purely mechanical storage of gas in gasometers [gasholders];" "the majority of existing 'point-five' undertakings assess fixed charges on the basis of rateable value, and it would *seem* that there is considerable risk of this becoming standard practice." Then he proceeds to set out arguments, figures, and curves, which "*seem*" to him "to demonstrate conclusively that the rateable value basis is not equitable." From this, it is clear that the person who communicated the article is wandering about in a state of indefiniteness. There is little that is positive; things merely "seem" to be something or other. However, it is interesting to know that the writer has got so near conviction as to believe that current must be supplied at ½d., or less, per unit before there can be any hope of it making any material headway for domestic cooking. It is equally interesting to know that heating and cooking arrangements only "seem" to be emerging from the state which has so long kept them from gaining any general popularity. It is further interesting to have the electrical recognition that storage differentiates considerably between the status of electrical energy and that of gas. Rateable value as a basis for charging has not only seemed to us, but it has been definitely declared by us, to be inequitable. We hope our indefinite friend will consider whether there is not such inequity as to make the system give preference to some consumers, and so produce an illegality.

Point-Five Inequity.

The points that are made in the first article to show that rateable value as a basis of charge is inequitable have been previously recognized. The first is that the assessment of a house is no criterion whatever as to its electricity consuming capacity. While one house may be just as large as another, the size and habits of the family may be altogether different. Then the writer points out that, if allowance is to be made for the effect on rateable value of a specially large or small garden (as seems essential),

the rateable value tariff at once loses its merits of simplicity and power of being easily understood by the layman. In fixing on a percentage upon rateable value, it is usual to analyze previous accounts to see what percentage will, with the 0·5d. per unit, yield the same revenue as from the previous flat-rate. This method of arriving at a percentage is described as a tedious one, which does not assure that the percentage will not be wide of the mark in individual cases, and suitable under the new conditions which it is desired to bring about by the new tariff. The same percentage applied to differently rated houses helps to produce a largely varying charge per unit, according to the consumption. The consumption may be no more in the heavily rated house than in the other one, though the hypothesis is that it should be considerably more. Take a house rated at £20 and another rated at £60, and a 15 per cent. charge on these figures. Supposing both use 500 units per annum. What happens? The lower rated house pays 1·44d. per unit through the fixed charge; the higher rated one 4·32d. The addition of the 0·5d. per unit makes 1·94d. and 4·82d. per unit respectively. What equity is there in this? These are extreme conditions; but they may be found in low-rated houses and highly-rated flats in a residential district. Inequity stamps the rateable system from beginning to end.

A Breakdown.

In the seat of cheap electrical energy, the Newcastle and Gateshead Gas Company supply about 750 million cubic feet of gas per annum for industrial purposes—a large proportion of it being for power. This fact alone in the experience of the one company stands out big and strong against the silly notices that the electrical papers give, and make much of, when an electric-motor displaces a gas-engine. Another fact is that the gas-engine makers were remarkably busy before the war, and have been so since. Some makers have had to extend their works in order to cope with production; and their dividends the last few years have not shown any disposition to shrink. Notwithstanding, according to "Electrical Industries," the "JOURNAL" has been trying to "revive" the case for the gas-engine against electric-motors; and, of course, also according to our electrical contemporary, the articles that were recently published by us from the pen and actual experiences of Mr. Widlake, gave "proof" of the poverty of argument which afflicts the advocates of central driving by gas-engines. This is the contemporary that made such an awful mess when it attempted to criticize these articles, and carefully avoided reference to the actual cost per B.H.P., whereas in Mr. Widlake's articles he showed that this basis was the one on which the respective merits of the rival motors should be fought out. Our electrical contemporary says it has known cases in which electric supply undertakings have kept electric-motors in reserve for the day when a particular engine would give up the ghost. In other words, the electrical people can only effect a change in some factories by letting capital in electric-motors lie idle while waiting for the collapse of a veteran gas-engine. The writer proceeds to refer to a definite case, in which the proprietor of a factory had electric power in one department, but not in another where there was a gas-engine. He did not, however, feel disposed to offhand supplant the gas-engine by electric-motors, even though by appearances it was very old; and apparently, without trying a modern gas-engine, he seems to have made up his mind to have an electric-motor in its stead when the old gas-engine became incapacitated. The day came when the gas-engine succumbed to the infirmities developed by old-age; and then, and not till then, two motors succeeded it.

Pertinent Points.

Well, now, is there anything remarkable in a gas-engine or any other piece of machinery being unable to resist the ravages of age and hard work? It does not require any great strain on the memory to recall instances of armatures, field coils, &c., of electric-motors getting burned out, with precisely the same—perhaps even greater—dislocating effect upon the plant they are driving as the gas-engine defects alluded to would have. Spare parts for a gas-engine may be kept as easily as spare armatures and field coils for an electric-motor. Further, no mention is made in the article of the age of the gas-engine in question or of the work it had done. Looking at the illustrations, it appears to be an old type of Crossley engine which, by all rules of depreciation, had reached the old-iron stage long before the defects mentioned occurred. If "Electrical Industries" wants its arguments to carry weight, why does it not take a concrete example, and compare on a cost basis a gas-engine and an electric-motor—both of modern type and doing equal work. We have called the attention of our contemporary before to an article published in our columns in connection with the displacement of an electric-motor by an old gas-engine, and asked it to criticize the facts contained therein—facts as to costs and work done [*see* "JOURNAL" for June 22 last, p. 695]. But it has not complied.

Scottish Junior Gas Association (Eastern District).—The opening business meeting of the Association for the session 1915-16 will take place next Saturday, in the Heriot Watt College, Edinburgh, when Mr. J. D. Luck, of Markinch, will read a paper entitled "Distribution Extensions and Alterations at Markinch." There will be subsequent meetings on Nov. 14 at Perth, Feb. 6 at Dunfermline, and April 23, the annual meeting in Edinburgh.

WAR-TIME GAS PROBLEMS IN FRANCE.

SOME short while since [in our issue for Aug. 10, p. 284], we made brief reference to the work of the French Gas Professional Syndicate (the "Syndicat Professionnel de l'Industrie du Gaz") and particularly to the matters with which it has had to deal as the result of the European war.

The report of the Syndicate for the year 1914 is a quarto publication of fifty pages, largely devoted to the business questions connected with the gas industry which are peculiar to France, and thus dealing at length with labour matters, legal decisions, and with the propagandist work which in normal times forms a large part of the activity of the Syndicate. The interest of these subjects, however, is overshadowed by the special measures the Syndicate carried out. with very commendable promptness and discretion, in its endeavour to assist gas undertakings in France in bridging-over the difficult months which followed the outbreak of war. Although the report refers only to the year 1914, and therefore covers only the first five months of the war, yet the bare recital of the problems presented to the French gas industry in that period, and of the Syndicate's steps in dealing with them, runs to a length which is, in itself, an indication of the difficulties of the task, cheerfully assumed by our French *confrères*. Their difficulties were in many respects greater than ours, though of like nature—viz., the purchase and transport of coal, and the disposal of coke, tar, sulphate, &c., in the exceptional conditions suddenly created by the war. It may be of interest if we publish, as we do below, an abridged account of the experiences recorded in the report, for the reasons that many of them are intimately connected with conditions in this country, and that the Syndicate in certain cases outlines measures which may be taken for the protection of gas interests after the war.

The declaration of war in August last year found the Syndicate prorogued for its regular summer vacation; but meetings were quickly summoned in Paris of those members not taken away by military or other duties. It was then resolved that the Syndicate should devote itself, in a broad national spirit, to the service of gas undertakings throughout France—whether members of the Syndicate or otherwise, and should at the same time hold itself in readiness for taking their full share in the organization of the defence of the country. It thus at once placed itself in communication with the War Department. Its first step was the purchase of 100,000 tonnes of coal (subsequently raised to 120,000 tonnes) in England, and the establishment at Bordeaux (at the time of the removal of the Government to the town) of a bureau for the supply of coal and its distribution throughout the country according to local requirements. At the same time, it made other purchases of English coals required by various French gas-works; England being almost the only source of supply, and one able to make itself responsible for transport.

The bureau at Bordeaux, under the direction of M. Décluy, and in conjunction with the Syndicate in Paris, thus rendered most valuable service in controlling the supply of coal, in avoiding delays, and in supervising the distribution of coke. On the return of the War Department to Paris, the bureau was closed. In the case of many gas-works, the situation in the first months of the war was saved by the organized purchase and distribution of coal—a system which since then has been consistently applied for the purpose of ensuring supplies and effecting economies. This work, although admittedly incomplete, has been carried out at great personal sacrifices on the part of members of the Syndicate.

A further matter which has most seriously engaged the attention of the Syndicate is the legality of contracts made in times of peace, in view of the world-wide disturbance of the cost of raw materials and of transport. The report quotes M. Larnaude, a Professor of Law of Paris and President of the National Committee for dealing with damages sustained as the result of the war, to the effect: "Jurists must not continue to treat the war as a simple chance event or *force majeure* in its application to those who suffer from it. Any such view and such terms do not fit present times. They must be expunged from our laws and our judgments." The Syndicate interprets the opinion thus expressed by a high authority as fully justifying the demand for the amelioration of losses by those who can, and in common justice should, take their share to this end. Some municipal authorities have not hesitated to consent to increases in the price of gas—varying according to circumstances. They realized that they could not leave the public services entrusted to their concessionaires to suffer, and that ordinary prudence forbade them, now more than at any time, to burden themselves with so heavy a load. Examples such as these find a following, particularly with the approval of communal authorities, who are the persons best informed as to the need of gas and electricity for railway stations, hospitals, and depôts engaged in the national defence.

The Syndicate refers to its efforts—fruitless up to now—made with the object of obtaining Government intervention in the supply and transport of coal for gas making. In this connection, it quotes the similar demands for intervention made in this country by the "JOURNAL." The action of English gas companies in raising the price of gas is recognized by French undertakings as the means to be adopted for the remedy of the misfortunes arising from the war. In reviewing the question of coal supply during 1914, the Syndicate notes first a slackening of the

French production at the beginning of the period, as a result of the suppression of long workings and of the operation of the three-year law which withdrew more men for military service than in the previous year. Coal from the Nord and Pas-de-Calais districts was 3½ fr. to 4 fr. dearer than in 1912; while there were delays in delivery. In June, the price of Belgian coal fell 1 fr.; in the Loire, a strike in March had serious consequences; and in l'Aveyron and the Tarn, prices steadily advanced.

Such were the conditions when, with the outbreak of war, supplies were entirely upset by the almost complete occupation of the Nord and Pas de Calais districts. Only two mines (one under enemy fire) remained for the supply of a certain number of gas-works under conditions of regular delivery and of price, which, after making allowances for the circumstances, prompted complaint by customers. Subsequently, their deliveries were further reduced, in consequence of military demands.

The Syndicate has continuously examined the means for improving the facilities for the transport of coal, both by rail and canal, to works in the worse-situated districts—such as in the Central and South-Eastern parts of France. It also undertook active negotiations with a view to obtaining more favourable terms for transport over the "P.L.M." railway system—the existing tariff being drafted for the benefit of mines in the Loire and Saone-et-Loire districts. The suggestion has been made that the tariff should apply in both directions of travel; but the matter stands adjourned for the present.

The report then proceeds to dwell upon the course of the price of English coals which had advanced towards the end of 1911, and reached a very high figure in 1912, owing to the general coal strike of that year. French gas-works using English coal likewise felt the effect of the Balkan and Turco-Italian wars. These high prices were maintained during 1913; and at the beginning of 1914 first-quality coal and Special Wear coal stood at 15s. 6d. to 15s. 9d. per ton, as compared with 9s. 9d. and 10s. 6d. in January, 1911. These prices fell slightly in the early part of 1914. The report quotes the figures published in the "JOURNAL" of the coal prices in 1914-15—pointing out that, contrary to expectation, they were slightly lower during the second three months of the war, as the result of the closing of certain markets. Transactions took place as usual, except that in some instances payment was asked for in advance of shipment.

The question of coal prices in the English market, however, is of such importance to the French companies that the Syndicate extends the scope of its report into 1915 in order to deal with it. It notes the sharp general but small fall in the cost of freight in the early part of the present year and contemporaneous with the annulment by the mines of arrears on order, and in some instances even of arrears going back to Dec. 31. The majority refused to make contracts for a period; while in some contracts which were sealed, the possibility of fresh restrictions—and particularly a tax on exported coal—could be discerned. On this account demands were, in fact, made last year—upon the London gas companies, among others. The ground on which the advance in coal prices is justified by the mines—viz., the lessened production due to the enlistment of (according to some statements) 25 per cent. of the miners—is dismissed by the Syndicate as inadequate, in view of the lesser export, as shown by the British Board of Trade figures. These record a reduction in the first three months of 1915 of over 2½ million tonnes in comparison with 1914. The report also regards as a means of increased production (on which mine-owners may count, if necessary) the suspension by the Government of the Eight Hours Act. The general conclusion, drawn from the opinions of gas-makers in the country, is that the situation will become easier; so that it would be unwise to make contracts at the unreasonable prices now ruling [this refers to mid-April last]; yet at the same time the Syndicate recognized that the supply of English coal was a matter of such importance that it hesitated to advise its members emphatically one way or another.

Reviewing the universal rise in the cost of freights, the Syndicate regards as a last resource the purchase of coal supplies from the United States, as was done in France in 1900. However, at the outbreak of war American coals cost 20s. 6d. to 22s. 6d.; and the Syndicate regards this source as of service only in the event of further advances in the price of English coal and in cost of shipment from England. For the present, it is more directly concerned with the alarming increase of the latter item, which it is ready to recognize, on one part, as the result of the requisition of many steamers by the Government and of the interference with navigation by German submarines; but equally, on the other hand, of the action of shippers, who, like coal owners, have taken undue advantage of the situation.

The report quotes the protests against freight charges made by British gas-makers, and instances that of 15s. from Newcastle to London, as compared with less than 3s. in normal times. It notes with approval the establishment of the "London Coal Supply Advisory Committee," with its object, among others, of employing seized enemy ships at reasonable freightage rates. In addition to greatly enhanced freight charges, the crowding of French ports has led to additional demurrage charges, amounting in one instance (at Treport) to 10 fr. per tonne. The freightage outlook is one which the Syndicate feels it has not painted in unduly black colours, in which view it is confirmed by M. Capuron as the result of a visit by him to England for the purpose of further investigating on the spot this question and that of coal prices. Even were the prices of English coal maintained at a reasonable level by State control, the cost of shipment remains a serious factor for the French gas industry. As regards the use of enemy vessels seized by England, French participation in the scheme would appear to be barred by the excessive price asked for the ships.

As regards the sale of coke, the market followed a normal course during the greater part of 1914. The stocks recorded each month by the French Central Coke Committee showed unimportant variations. Gas makers have had reason to be grateful to the Committee for its labours in forwarding the industrial use of coke in many directions, and for the relations established by it between gas-works and the district unions. In England, in March, 1914, Durham coke was freely offered; and the January price of 16s. to 17s. fell to 13s. to 12s. towards July—rising to 18s. 9d. to 19s. in February, 1915. Similarly, in France the price of coke has lagged greatly behind that of coal. Difficulties of distribution by rail and canal have led to gas-works in the West and Midi finding themselves overstocked with coke, while other districts had none. Equilibrium was restored on application by the War Department to the Syndicate in January, 1914, as the result of which supplies available in individual works in the West and Midi were taken by the War Department at the price of 35 fr. to 40 fr., according to locality, instead of the 30 fr. first suggested but recognized as too low in regard to the constantly increasing cost of coal. In many cases, sales of coke were fixed by contracts made for the winter of 1913-14; while it was found difficult to raise the price of coal for domestic use. The same thing applied to other sales, where the scarcity of labour and cartage was an obstacle.

These retail sales moreover were a small fraction of the total supply, which latter (after deduction of dust and waste) scarcely exceeded two-thirds of the coke obtained from the retorts. In short, the serious rise in the price of coal was counterbalanced only to a very slight extent by the sales of coke, while other bye-products (such as sulphate and tar) suffered great reductions in price in 1914.

The report recalls the fact of the formation, in November, 1913, of the French National Lighting Committee, which, at the time of the outbreak of war, was composed of thirty-five members. It held several meetings during the first part of 1914, under the presidency of M. Violle, in order to formulate the course of its labours, roughly broken off by the dispersion of its members, of whom a number are with the colours. It is too soon to say when the different National Lighting Committees will be able to resume their work, or what will happen to the International Lighting Committee; but the fact that the formation of this last Committee dates from the special meeting of the International Photometric Commission held in Berlin in August, 1913, is sufficient ground for belief that its constitution will undergo radical changes.

A note issued by the Syndicate in February, 1914, gave particulars of recent contracts with regard to the supply of gas, conceding either a lower photometric value or the substitution of a reasonable calorific power for the photometric standard. The contracts likewise admit a certain latitude in the carrying out of the tests; and in two cases the use of water gas has been authorized under conditions which do not nullify the value of the addition. The national crisis has led French gas-makers to condemn more emphatically than on the occasion of coal strikes, there and in this country, the injurious opposition and short-sightedness of those who, under the cloak of hygiene, have placed obstacles to the use made of water gas in every other country, and have thus deprived the French gas industry of a most valuable means of husbanding its coal supplies and effecting financial economies.

As regards sulphate of ammonia, the report reviews, at a length which cannot be usefully translated in similar detail, the conditions before and during the war. It refers to the cutting campaign of the German Syndicate in November, 1913, and to the large excess importations of nitrate in the first half year of 1914 as compared with 1913. Similarly, Belgium and Germany, it is estimated, exported sulphate in the same period in quantity exceeding by over 30,000 tonnes that of the corresponding period of 1913. Since the outbreak of war the two chief producers have been England and the United States; while in France the market was good at first for various reasons—such as the infrequency and the higher freightage cost of English supplies, sales to Italy, and the requisition of nearly all nitrate by the War Department. Since then, however, supplies of sulphate were reserved for the munition service, with the exception of those from some few small gas-works; and the trade has thus come to a standstill. In view, however, of the very slight use of sulphate as a fertilizer in France during the autumn of last year and the spring of the present year, the Syndicate anticipated a great demand during this autumn. Beyond this period, the position will naturally depend more upon the general course of events than upon technical and commercial factors, although among these latter the Syndicate takes within its purview the production of competing synthetic fertilizers, from Norway, Sweden, and America—*e.g.*, nitrate of lime, cyanamide, and ammonia. The last-named threatened to be produced upon an enormous scale in Germany—on a scale large enough, as is now reported in Germany, to cover not only the requirements for the production of explosives but to enable the country to dispense afterwards with imported nitrate. No one can foretell the end of these vast schemes; but the Syndicate feels no doubt that the war, while imposing progress in the production of materials for military use, will likewise lead to results of benefit to peaceful industry.

As regards tar, the Syndicate is able to point with pride to the service which it has rendered alike to the French gas industry and to the French nation in conserving and distributing this

residual for military purposes. The importance of tar as a raw material in the production of explosives was fully recognized by the French authorities at quite an early stage of the war; but the utilization of the whole tar production in France has involved many delicate negotiations, in which the Syndicate—in the person of M. Décluy, seconded by M. Masse—has most ably taken a course in the national interest, and has been instrumental in harmonizing the separate interests of gas-makers and tar-distillers, without at any instant losing sight of the prime necessity of ensuring first the complete extraction from the tar of materials for the manufacture of explosives.

Its first business was to ascertain the quantity of tar in stock in the country, and to prepare figures of the national production to be expected in the altered conditions. Returns were obtained from 390 gas concerns—not including the large lighting companies in Paris and of lighting, heating, and power in Lyons, Marseilles, and St. Etienne. It then, under orders of the War Department, took steps to organize the distribution of this tonnage among the distilleries, in accordance with geographical position and ability to conform to Government requirements. One most important part of this work lay in bridging the gulf between the price which the gas-makers could justly demand and that which distillers declared themselves able to pay. Concessions were necessary in the interests of both parties, and no less in those of the Treasury; but through the indefatigable labours of MM. Décluy and Masse the national aim was fully attained.

In September and October, 1914, the Syndicate issued successive letters—the first, emphasizing the importance of tar in the defence of the country, and the second pointing out distilleries in the respective districts with which gas-makers should communicate. Many gas-works acted in accordance with these suggestions, though others—from inability to come to terms with distillers, and prompted by the high price of coal—used tar as fuel. The result of the Syndicate's recommendations was, however, to obtain the distillation of more than half the total tar production of France for the use of the Munitions Service. In November, 1914, at the request of the War Department that the whole of the gas tar in the country should be so applied, the Syndicate established a special department to work in collaboration with the Government to whom the Syndicate, a week or two later, appealed for intervention in the question of price—pointing out that in the absence of such intervention gas-makers had taken measures to comply with the requirements of the State. In January, 1915, the Syndicate was able to report to the Government that 3933 tonnes had been supplied to tar distilleries from Nov. 1 to Dec. 15, 1914; that works held 22,262 tonnes; and that the estimated production to the end of June, 1915, was 35,136 tonnes—making a total of 61,331 tonnes.

A month later the Syndicate was entrusted by the Government with the duty of ensuring the delivery to the distilleries of all tar made in the gas-works throughout France, and was asked to check the extraction by the distillers of all the products of service in the manufacture of explosives, and to deliver these products to the Munitions Service. Of these three commissions the Syndicate discharged, and is still discharging, the first. As regards the others, it placed itself at the disposal of the Munitions Service—its powers and constitution not permitting it to undertake control of the distilleries. Thus, by collaboration with the Government, the whole production of tar has been reserved for the manufacture of explosives; and the use of tar as fuel, or its sale for purposes other than the extraction of materials for the Munitions Service, has been forbidden. Every gas-works without exception accepted these conditions; and the Syndicate is able to say that no tar is, nor will be, distilled except for the requirements of the national defence. Moreover, every gas-works has agreed to the net price of 35 fr. fixed by the Government.

Benzol, from April to August, 1914, stood somewhat low in price—26 fr. in Paris. With the removal of German supplies, the prices reached 42 fr. The market then became entirely restricted. All supplies were requisitioned. Benzol and its homologues, and more particularly toluol, were the hydrocarbons of tar of prime importance in the manufacture of explosives. Its future movements are, of course, uncertain. The production will rise a little in France, and considerably in the United Kingdom; but it is too soon to speculate on the German supplies or on the steps to be taken in regard to them.

The Syndicate concludes its report by a brief reference to the effect of the war upon industries engaged in the manufacture of refined products—such as dyes, drugs, and perfumes derived from coal tar—the trade in which Germany has attained world-wide predominance. In regard to dyes, it is mentioned that the endeavours of Great Britain and the United States to establish this industry within their frontiers have had an equivalent in France. For example, a "Research Company" has been formed in Lyons to go into the matter. France is anxious to regain an industry of which (with England) it was one of the founders, and in which formerly it took a leading part. In so doing, it would be revenged upon the Germans, whose work on the synthetic production of alizarine has been the ruin of the cultivation of madder throughout a part of the Midi. It appears that inquiries as to the production of gas tar have been made by scientific men apparently to this end; but, the Syndicate very properly remarks, gas tar must cease to be necessary for munition purposes before anything can be done.

PERSONAL.

Captain F. J. Bywater, of the Royal Engineers, was, we learn from the "Birmingham Gas Department Magazine," in that neighbourhood about the middle of last month, on leave, prior to proceeding to France.

The position of Manager and Secretary to the Cromer Gas Company has been filled by the selection of Mr. Samuel Carpenter, late of Dorking. The vacancy occurred through the appointment, as mentioned in last week's "Journal," of Mr. F. Smallbone as Assistant-Engineer of the Brighton and Hove General Gas Company.

In intimating in last week's "Journal" the retirement of Mr. Joseph Cash, M.Inst.C.E., from the position of Engineer and General Manager of the Brighton and Hove General Gas Company, and his appointment as a member of the Board, it was stated that he has been identified with the Company for the last fifty-four years. Articled to the late Mr. J. Birch Paddon, M.Inst.C.E., in January, 1862, Mr. Cash served for four years, and then entered the service of the Brighton and Hove Gas Company, and soon after was appointed Assistant-Engineer. During this period, the works of the Company were transferred from Hove to Portslade, and Nos. 1 and 2 sections were constructed. In 1882, the Company amalgamated with the old Brighton Gas Company. On Jan. 1, 1886, Mr. Cash succeeded Mr. Paddon as Engineer and General Manager. Various extensions followed, and No. 3 section at Portslade was erected. Later on, carburetted water-gas plant was installed, followed by stoking machinery in the retort-house and coke-conveyors and coke-handling plant. During this latter period, the sale of gas has more than doubled, in face of the severe competition of the electric undertakings of the Brighton Corporation and the late Hove Electric Company, recently taken over by the Hove Corporation. The price of gas in 1886 was 3s. 6d. per 1000 cubic feet; and it was gradually reduced to 2s. 8d., until in April last, owing to the war, the price had to be increased to 2s. 11d. per 1000 cubic feet. The price now charged is, however, a moderate one, when the cost of coal, &c., on the South Coast is taken into consideration.

OBITUARY.

RICHARD FREEMAN.

It is with sorrow that we have to announce the death, last Tuesday night, owing to heart failure, of an old member of the editorial staff of the "Journal"—Mr. Richard Freeman. He had been directly on the staff since 1879; and before that was indirectly associated with it, and so was frequently brought into contact with Mr. Thomas G. Barlow and Mr. William Boughton King, the succeeding first two Editors of the "Journal," and long-time colleagues in the work associated with it. Mr. Freeman was not known generally to members of the British gas profession; but callers at the office often met him, and respected him (as did his colleagues), both for his own personal qualities and for the extraordinary capacity that he had for remembering dates and circumstances connected with the progress and ever-changing phases of the gas industry. He was well known to many of the members of the Société Technique, whose meetings he attended (prior to the last two or three) as the representative of the "Journal." He was an excellent French scholar, and well read in, and a very capable translator of technical subjects from, the French language. One of the delights, through his literary work, was the constant friendly communication which was developed between him and certain French gas engineers. Mr. Freeman was advancing in age; being in his 78th year at the time of his death. Although for a few months, owing to not being in health equal to the exertion, he had not done much work, prior to that he had been most regular in the performance of his duties. For some years he had turned a deaf ear to the suggestions of his friends that he should relinquish work; but he was restless and not particularly happy when away from his old surroundings and duties. So he, of his own choice, continued with us almost to the end; and we shall greatly miss him. In all truthfulness, we can at the end write of him: "Well done, good and faithful servant."

Included in the long list of casualties announced last week was the name of Second-Lieutenant A. G. H. Livesey, of the 3rd battalion (attached to the 1st battalion) of the Royal North Lancs Regiment, who was killed in action in France on Sept. 26-27. Lieutenant Livesey received his Commission on Oct. 4, 1914. He was the younger son of the late Mr. Frank Livesey, M.Inst.C.E., and nephew of the late Sir George Livesey.

Second-Lieutenant E. W. Blenkinsop, second son of Mr. H. W. Blenkinsop, the Under Sheriff for Warwickshire, has been killed at the Front. When the war broke out Lieutenant Blenkinsop enlisted as a private in the Royal Fusiliers, and was later given a commission in the Royal Welsh Fusiliers, from which regiment he was transferred to the 2nd Royal Warwicks. Lieutenant Blenkinsop was articled to Mr. Thomas Berridge, a Director and the Consulting Engineer to the Leamington and Warwick Gas Companies, with whom he remained four years. On leaving, he became Assistant-Manager at the Warwick works, with every prospect of a successful career.

GAS-FIRES AND VENTILATION.

THE contribution made by Mr. H. James Yates, of Birmingham, to the debate on "Smoke Prevention" at the meeting last month of the British Association, which was reproduced *in extenso* in the "JOURNAL" for Sept. 14 [p. 586], has now been printed in pamphlet form, together with a series of diagrams which are very helpful in studying what Mr. Yates had to say. We therefore give the diagrams now, and refer readers for the text of the communication to the issue named.

DIAGRAMS OF THE COMPARATIVE VENTILATION OF AN "INJECTOR-VENTILATING" GAS-FIRE, AN ORDINARY GAS-FIRE, AND A COAL-FIRE.

[NOTE.—Extra CO_2 was added to the air of the room, which was then mixed and analyzed—sample headed X. After the lapse of a definite period, during which the fire was ventilating, three series of samples were taken.]

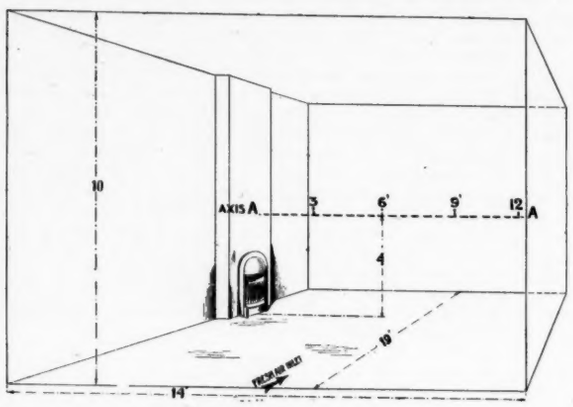


Fig. 1. Series 1.—Samples taken simultaneously along Axis A, at right angles to the Fire, and 4 feet from the Floor, at 3 feet, 6 feet, 9 feet, and 12 feet from the Fire.

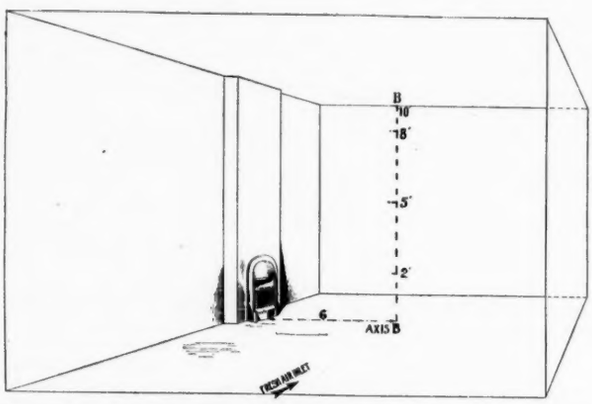


Fig. 2. Series 2.—Samples taken simultaneously along Axis B, and 6 feet from the Fire, at 2 feet, 5 feet, 8 feet, and 10 feet from the Floor.

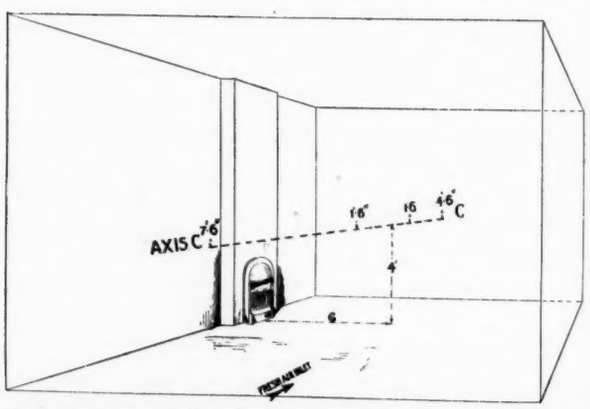


Fig. 3. Series 3.—Samples taken simultaneously along Axis C, 4 feet from the Floor, and parallel to the Fire, at 1 ft. 6 in. and 4 ft. 6 in. on the Right of Axis A, and 1 ft. 6 in. and 7 ft. 6 in. on the Left of Axis A.

[NOTES to figs. 4, 5, and 6.—The squares are 1 foot each way. The area enclosed by the dotted line (····) corresponds approximately to that ventilated by the ordinary gas-fire; the area enclosed by the line of crosses (X X X) to that ventilated by the "Injector-Ventilating" gas-fire; and that enclosed by the line of dashes (— — —) to that ventilated by the coal-fire. The figures for the CO_2 denote the amount to which it was reduced in a given time and not the ultimate figure to which it would be reduced if ventilation were allowed to proceed until the CO_2 became constant. The figures outside the squares refer to the distances from the fire, as shown in figs. 1, 2, and 3. The figures along the axes refer to the analysis, as given in explanatory note—the upper line of figures in each group referring to the coal-fire, the central line to the "Injector-Ventilating" gas-fire, and the bottom line to the ordinary gas-fire.]

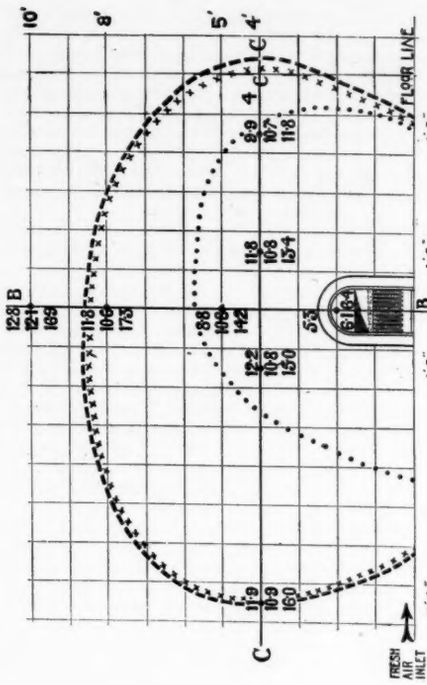


Fig. 6.—Sectional Elevation along Axes B and C (figs. 2 and 3), showing the Approximate Area ventilated along these Axes.

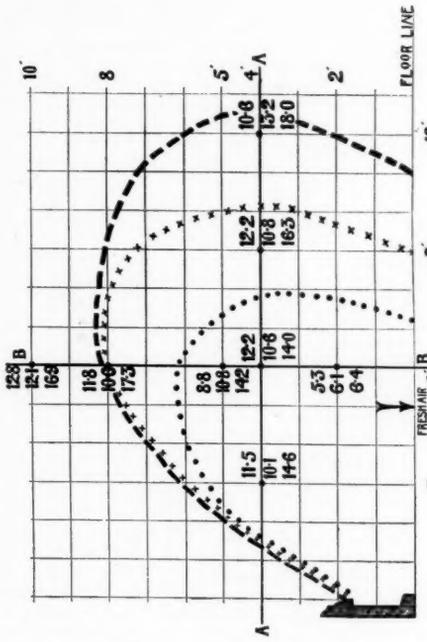


Fig. 5.—Sectional Elevation along Axes A and B (figs. 1 and 2), showing the Approximate Area ventilated along these Axes.

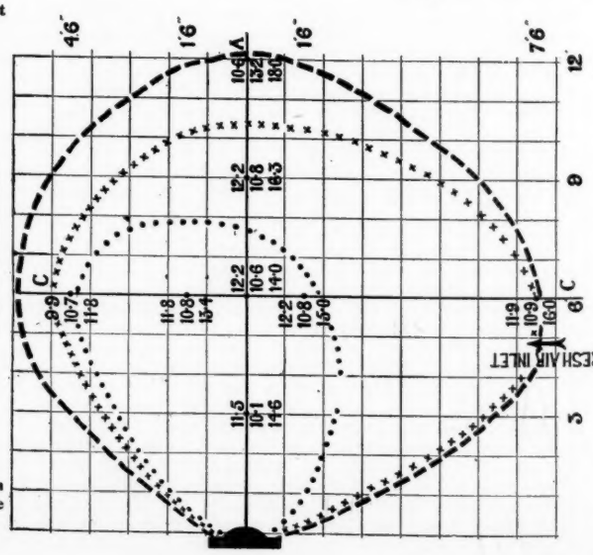


Fig. 4.—Sectional Plan along the Axes A and C (figs. 1 and 3), showing the Approximate Area ventilated along these Axes.

TABULATION OF RESULTS.

Parts of CO_2 per 10,000 *in Figs.* 4 *and* 5.

	X	3-Inch.	6-Inch.	9-Inch.	12-Inch.
"Injector-Ventilating" fire	15·0	10·1	10·6	10·8	13·2
Ordinary gas-fire . . .	18·0	14·6	14·0	16·3	18·0
Coal-fire	15·0	11·5	12·2	12·2	10·6

Parts of CO_2 per 10,000 *in Figs.* 5 *and* 6.

	X	2-Inch.	5-Inch.	8-Inch.	10-Inch.
"Injector-Ventilating" fire	15·0	6·1	10·8	10·6	12·1
Ordinary gas-fire . . .	18·0	6·4	14·2	17·3	16·9
Coal-fire	15·0	5·3	8·8	11·8	12·8

Parts of CO_2 per 10,000 *in Figs.* 4 *and* 6.

	X	7 ft. 6 in. Left	1 ft. 6 in. Left	1 ft. 6 in. Right	4 ft. 6 in. Right
			of Axis A.		
"Injector-Ventilating" fire	15·0	10·9	10·8	10·8	10·7
Ordinary gas-fire. . . .	18·0	16·0	15·0	13·4	11·8
Coal-fire	15·0	11·9	12·2	11·8	9·9

Fig. 4.—Sectional Plan along the Axes A and C, showing the Approximate Area ventilated along these Axes.

LOW TEMPERATURE CARBONIZATION.

The Rollason Process.

The numbers of the "JOURNAL" for Sept. 21 and 28 contained references [pp. 635, 696] to the Rollason process for the treatment of coal; and, under the above heading, the "Iron and Coal Trades' Review" for the 1st inst. made the following reference to the matter.

There is certainly nothing new in low-temperature carbonization; and, in the light of past experience, one is disposed to regard somewhat sceptically the commercial possibilities of any such process. Hitherto in the process only the highest quality of coking coal has been used—mainly to permit of the residue being recovered in the form of a fuel which will stand handling and transport. With these coking coals, however, owing in many instances to the low ash content, the gases cannot be evolved at a low temperature, or a coke be produced of sufficient hardness. It is therefore necessary to raise the temperature so high that the hydrocarbon vapours evolved are split-up into methane and hydrogen—leaving most of the carbon in the amorphous form, causing the coke to be soft and friable. The yield of oils is, therefore, low compared to the volume of hydrocarbons contained in the coal.

We may assume that in all systems of low-temperature carbonization hitherto, the coal is carbonized at a temperature of approximately 450° C. A ton of coking coal of average quality carbonized by this process would yield 12 to 18 gallons of tar oils, 20 to 25 lbs. of sulphate of ammonia, and approximately 2½ gallons of benzol from washing the gases—leaving about 70 per cent. residue in the form of a soft, friable coke, for which it is difficult to find a profitable market.

No serious attempts have hitherto been made to utilize in the low-temperature system non-coking and semi-coking coals for the production of oils, many qualities of which contain a high percentage of volatile matter. It is in this connection that the patented system evolved by Mr. A. Rollason, whose experimental plant at Pye Bridge was recently inspected by our representative, will prove of particular interest to colliery owners who in normal times have sometimes difficulty in disposing of their small coal. The primary object of the new process is the production from non-coking and semi-coking coals of a large volume of light hydrocarbon oils, free from tar, acids, or sulphur compounds, and, as a secondary consideration, the formation of a residue suitable for conversion into a high-class, free-burning, smokeless briquette. To achieve this, a finely-ground limestone is mixed with the crushed coal before it is fed into the retort. The essential difference between the Rollason and other systems of low-temperature carbonization lies in the employment of this limestone, and the catalytic action set up thereby. Only a small percentage of limestone is used—the amount varying somewhat according to the nature of the oils it is desired to produce.

The limestone serves a dual purpose in the retort: (1) It takes up the heat and decomposes at a low temperature when in contact with coal having a high oxygen content; (2) on the decomposition of the limestone, the calcium oxide is freed from its neutralizing agent, carbon dioxide, and, being now in a nascent condition and chemically active, attacks and (assisted by the heat of carbonization) decomposes the organic matters and bases contained in the coal—thus liberating the gases at a low temperature, usually below, but never exceeding, 450° C. The calcium by its catalytic agency assists in the combination of oxygen and hydrogen, forming water, and carbon and hydrogen, forming hydrocarbons. The water vapour thus formed acts as a carrier for the hydrocarbons, and prevents their decomposition into gases while in the retort. After these vapours leave the retort, they are condensed into water and crude light oils, which, as previously stated, are free from tar, acids, and sulphur compounds.

It should be particularly noted that, in the system under consideration, the water is liberated separately from the hydrocarbon vapours during carbonization, and at a temperature sufficiently low to prevent these condensable vapours from being split-up into incondensable gases; whereas in the ordinary methods of low-temperature carbonization the water comes over mixed with oils, and they are somewhat difficult to separate.

Approximate results are seldom very convincing; but the results actually obtained with coal from the main seam at Askern Colliery, Doncaster, are certainly interesting. The coal, as received from the colliery, gave the following analysis: Volatile matter, 32·2 per cent.; ash, 4·10 per cent.; sulphur, 1·17 per cent.; nitrogen, 1·34 per cent.; fixed carbon, &c., 61·19 per cent. The carbonization of a ton of this fuel yielded 21½ gallons of crude light oils, suitable for conversion into motor spirit, which upon treatment produced 15 gallons of refined spirit. The residue after distillation, amounting to 14 cwt., with 5 per cent. of fine coal added, is in a condition for conversion into hard briquettes. Briquettes made from this residue have a good appearance, are hard, and are said to stand up well in the fire and to be practically smokeless.

The total cost of carbonization, refining, and conversion of the oils into motor spirit, and briquetting the residue, is approximately 6s. 8d. per ton of coal, compared with a total cost of about 4s. 6d. per ton of coal carbonized by the usual low-temperature process. In considering this cost, it must not be overlooked that the new process employs a lower-grade coal, and, apart from the increased yield of oils, provides for the manufacture of the residue into a fuel for which there is an ever-growing market.

The use of a catalytic, however, is not confined to low-temperature systems. It has already been employed with a considerable measure of success at gas-works, resulting, according to report, in an increased quantity of gas of a higher calorific value per ton of coal, a sensible decrease in the quantity of sulphur compounds, less deposit of naphthalene in the services, less deposit of graphitic carbon on the sides of the retorts, a much more liquid tar, containing a greater quantity of the higher aromatic hydrocarbons, a sensible increase in the quantity of ammonia, while the toluene recovered after washing the gases was increased fourfold, and, finally, there was a material increase in the percentage of large coke, and an all-round improvement in the quality.

Our readers, however, will be more directly interested in the use of the catalytic in connection with the bye-product coke-oven, to which the advantages claimed when carbonizing non-coking fuels are equally applicable. It is, of course, merely a question of the size of the retort. In the first place a lower temperature can be used for carbonization, resulting in an increased yield of ammonia and benzols, and an improved quality of tar. A corresponding increase in the large saleable coke is also claimed to result. Not the least important claim is that the destruction of the oven linings is prevented, owing to the surplus oxygen being used up by combination with a portion of the hydrogen before the iron sulphide is decomposed—thus preventing the formation of sulphurous acid, which combines with the sodium chloride in the presence of manganese contained in the coal, forming hydrochloric acid, which attacks and decomposes the iron contained in the fire-brick.

This temperature system of low carbonization is being exploited by the Basic Carbonizing Syndicate, Limited, and the other applications of the catalytic by the Synthetic Gas Processes Company, both of Nottingham.

As already mentioned, the experimental retort is at Pye Bridge. This, however, calls for little special description. The retort, which has a holding capacity of 8 cwt., consists of a cylindrical receptacle surrounded by brickwork. A bunsen burner is placed beneath the retort; and the products of combustion circulate around and between it and the chamber walls. The outlet is formed of a coiled pipe in which condensation takes place, and which terminates in the oil-tank. From this last the oil and water are separated out.

London and Southern District Junior Gas Association.

The programme of the Association for the forthcoming session (a copy of which is to hand from the Hon. Secretary, Mr. George Winslow) is as follows:—

Oct. 22.—Address by the President (Mr. S. B. Chandler, of the South Suburban Gas Company).
Nov. 12.—Paper by Mr. Hartley (of Richmonds, Limited), on "Development of Gas-Fires, 1913-15."
Nov. 26.—Paper by Mr. B. W. Brooks (of the Gas Light and Coke Company), on "Gas-Furnaces."
Dec. 4.—Visit to Industrial Appliance Show-Rooms and Demonstration Workshops of the Gas Light and Coke Company, Goswell Road.
Dec. 10.—Paper by Mr. W. L. Westbrook, on the "Gas-Cooker *versus* Coal Range for Domestic Purposes."

1916.

Jan. 28.—Paper by Mr. E. Stroud (of Holophane Limited), on "Modern Illumination as Applied to Gas Lighting."
Feb. 5.—Visit to the Works of the Wandsworth Gas Company.
Feb. 25.—Paper by Mr. Arthur R. Griggs, on "The Microscopic Examination of Metals: Its Application to Gas-Works Engineering."
March 12.—Visit to the Works of the South Suburban Gas Company.
March 25.—Paper by Mr. E. W. L. Nicol (of the London Coke Committee), entitled "Coke as a Fuel for Steam-Motors, &c."
April 9.—Visit to the Works of the Tottenham Light, Heat, and Power Company.
April 29.—Lantern Slide Meeting of Technical Interest by Mr. J. G. Clark.
May 13.—Annual General Business Meeting.
June 18.—Summer Meeting. Visit to the Works of the Hampton Court Gas Company.

COAL AND COKE CONVEYING PLANT AT THE OBUDA GAS-WORKS, BUDAPEST.

By Herr VIKTOR SCHÖN, the Deputy-Manager of the Budapest Gas-Works.

A general description of the new Obuda Gas-Works at Budapest, taken from an account published by Herr I. Bernauer, the Manager of the works, was given in the "JOURNAL" recently [Vol. CXXXI., pp. 21, 77, 125, 181]. A detailed account of the coal and coke conveying plant was given by Herr Viktor Schön, the Deputy Technical Manager, at the thirty-third annual meeting of Gas and Water Engineers of Austria-Hungary, and has been published in the "Journal für Gasbeleuchtung" for Aug. 14, 21, and 28. The following is a summary of Herr Schön's paper.

GENERAL REQUIREMENTS.

The guiding principle in the scheme of the whole plant, as well as in designing particular parts of it, was that the plant should provide a simple and rational equipment which would be economical in working and would adapt itself to the subsequent extension of the gas-works. The conditions which the plant had to fulfil may be set out as follows.

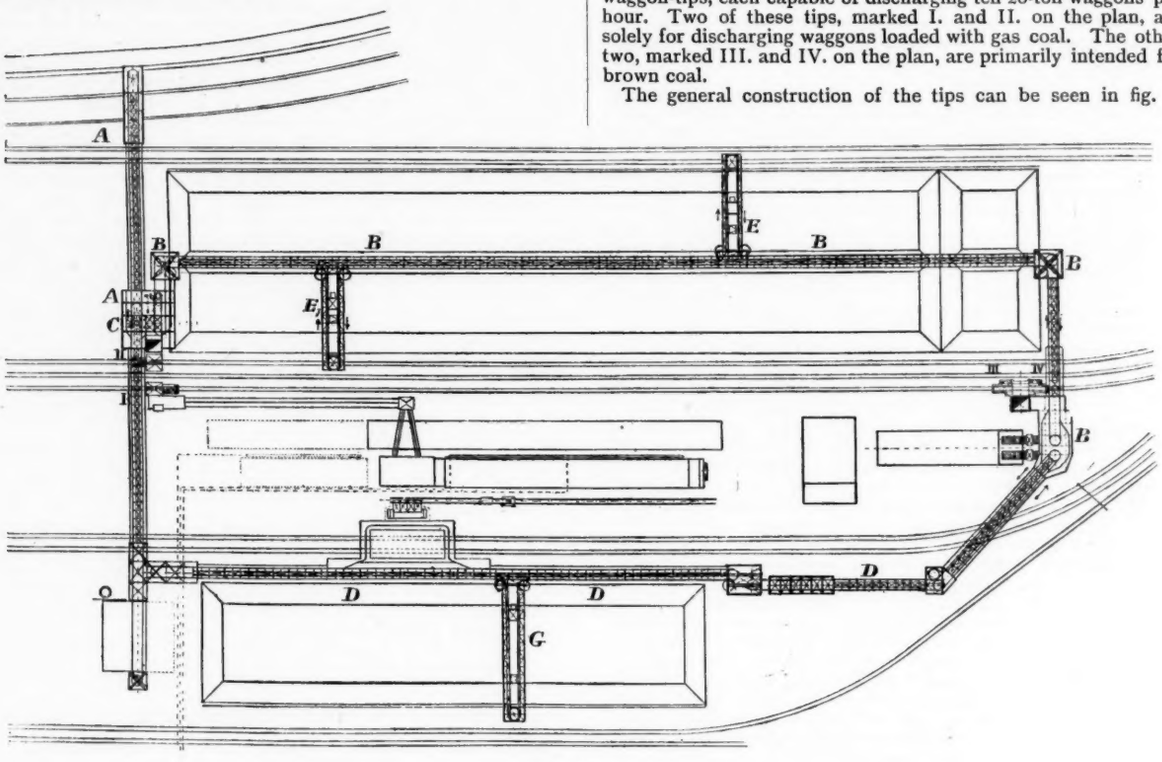


FIG. 1.

The coal conveying plant was required: 1.—To convey coal arriving in waggons to (*a*) the storage bunker of the carbonizing plant, and (*b*) the coal storage yard. 2.—To convey brown coal or lignite arriving in waggons to (*a*) the storage bunker of the producer plant, (*b*) the storage yard, (*c*) the storage bunker of the boiler plant. 3.—To pick up gas coal and brown coal from the storage yard and convey them into one of the three storage bunkers already named. 4.—To pick up coal arriving by water and convey it into the storage bunker of the carbonizing plant or to the coal storage yard.

The coke-conveying plant was required: 1.—To convey the coke discharged from the carbonizing chambers to the coke-breakers, and thence to the sorting plant. 2.—To convey the sorted coke (*a*) to the coke storage yard, (*b*) direct into railway waggons, (*c*) to the bunker for retailing, (*d*) to the storage bunker of the producer plant, (*e*) to the storage bunker of the boiler house, (*f*) to barges on the Danube Quay; also to pick up coke from the storage yard and convey it to the points named under (*b*) to (*f*).

The coal-conveying and coke-conveying plants were therefore required for nine to twelve works' operations. All these have been provided for except the conveying of coal from ships. This is a source of supply which will not be brought into use at present. The central operating station and the overhead line leading to the Danube Quay have, however, been made large enough to admit of grabs being later introduced on the quay without difficulty.

Before proceeding to describe the arrangements adopted, it may be mentioned that it was ascertained, from a study of the matter and calculations, that the coal and coke conveying plant would have to be equal to a daily productive capacity of 14,125,000 cubic feet of gas, although the carbonizing plant itself was for the time being constructed for a daily capacity of only 9,535,000 cubic feet. For the production of the former quantity of gas, about 1200 tons of coal are required, which would yield 840 tons of coke. For heating the settings there would be required daily about 200 tons of brown coal or lignite; making, with a further quantity of 50 tons used under the boilers, a total of 250 tons of brown coal. In determining the size of the coal-conveying plant, attention had, however, to be given to the fact that the coal does not arrive by rail at a uniform rate, but occasionally two or three times as much on one day as on other days; and this must be dealt with without interruption.

COAL CONVEYING PLANT.

DISCHARGING THE COAL-WAGGONS.

The loaded waggons are drawn up on arrival as complete trains on the middle of the three tracks alongside the west side of the coal storage yard. The waggons are then brought separately, by means of a rope shunting installation and two sets of points, to the waggon-tips constructed on the first and third tracks. In the plan given in fig. 1, the three tracks are shown, but the switches are outside the plan to the left. There are altogether four waggon-tips, each capable of discharging ten 20-ton waggons per hour. Two of these tips, marked I. and II. on the plan, are solely for discharging waggons loaded with gas coal. The other two, marked III. and IV. on the plan, are primarily intended for brown coal.

The general construction of the tips can be seen in fig. 2. They are anchored at one end to the foundation, and the other end is raised or lowered by means of a pair of rollers. The pair of rollers is moved by a strong Gall's chain by an electromotor of 30 H.P. The track or travel of the rollers is so arranged that the waggon is raised only slowly at first; and the rate increases as the vertical through the centre of gravity of the waggon approaches the turning point. The tips are operated from control boxes partly below the ground level at the side of the tracks. The waggons are kept in place by two powerful hooks, which are attached to the front axle. The waggon bodies also are held down by a chain. The construction is so simple that the cost was relatively small. Further, the cost of the foundations was much less than with the older types of waggon tips. At both discharging points there are two tips facing in opposite directions; so that waggons having a brakesman's box at one end (as is common with Continental waggons) can be discharged without having to be turned round. The two waggon-tips alongside the producer plant are both on the same track facing one another; but the two adjoining the central operating station are on separate tracks.

DIRECT SUPPLY OF THE CARBONIZING PLANT WITH COAL.

A coal-bunker, in reinforced concrete, is provided, capable of containing the 1200 tons for a full day's requirements. Charging waggons, driven electrically on rails passing underneath this bunker, are charged from it, as described in Herr Bernauer's article already referred to. The bunker is filled in the following manner: In front of each of the waggon-tips Nos. I. and II. a wrought-iron bunker is constructed beneath the tracks, and the

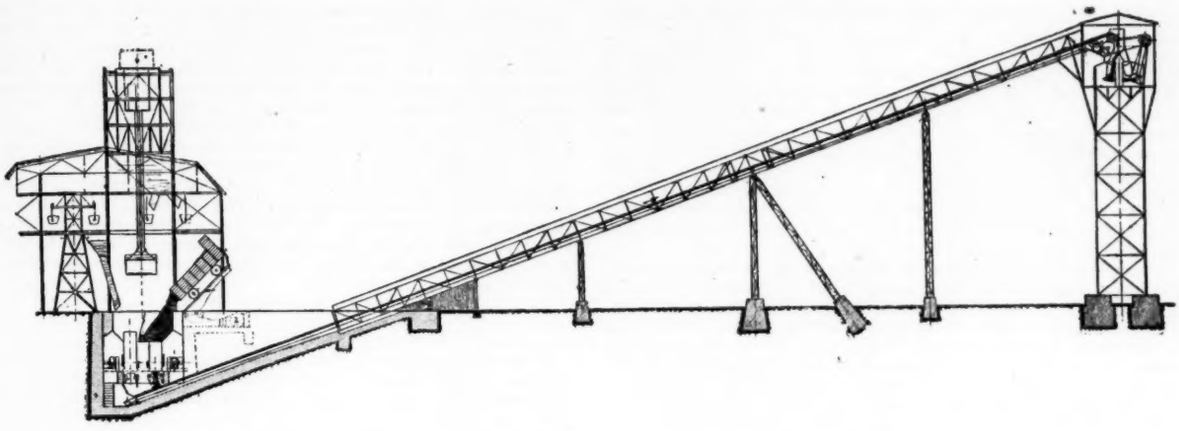


FIG. 2.

coal is shot from the waggons into it. Each of these bunkers has two outlets, with sliding valves, through which the coal passes into the "Seltner" coal-breakers, each of 60 tons per hour capacity, placed below the bunkers, as shown in figs. 2 and 3.

The coal-breaking plant is provided with mechanical receiving grids. The large coal which does not pass through the grids is delivered to the breakers; while the smaller coal misses the latter and falls direct on to the band conveyor. Each pair of breakers, is behind the other, delivers the coal, when broken to the size of the fist, on to a rubber band conveyor (shown in figs. 2 and 3) running underneath, which is driven by a 16 H.P. motor. The breakers are encased by sheet iron. The pits in which they are placed have two large extraction pipes, by which the dust is drawn away. The breakers are of the roller type, each having two rollers with blades and a fixed bladed harrow.

The rubber conveying bands running underneath the breakers are 32 inches wide, and each has a capacity of 120 tons per hour. They are mounted on a wheeled framing, by which they can be shifted longitudinally, so that a 3 H.P. motor will drive both Thus either of the two bands can deliver the coal on to either of the two elevating conveyors shown in fig. 2. Adequate provision has been made for removing the dust from the underground breaker chambers. The coal delivered from the band conveyors falls through funnels on to one of the two bands, which rise at an angle of 18°. These convey it to the corner station, where it is delivered by them on to one of two transverse bands.

The band elevators are inside a covered gangway with iron framing, roofed with sheets of "Eternite," and with roof lights. At the corner station at the top of the incline is a 40 H.P. electromotor, which drives both the elevating bands and the transverse bands at the top of the incline. The coal falls from the transverse bands into the bunkers through discharging waggons which are constantly moving to and fro—see fig. 4. All the equipment is provided in duplicate, and with portions of each set interchangeable; so that interruption of working may be regarded as out of the question. The 1200-ton coal-bunker can be filled in ten hours.

Storage of Coal.

The storage of gas coal which is not required directly at the settings takes place in the following way: Alongside each of the two waggon-tip stations there is a deep pit, into which the coal drops as it is tipped from the waggons. The No. I. tip is not intended for the storage of coal, but only for the supply of the carbonizing plant. If coal is to be stored from the No. II. tip, the slides shown in figs. 2 and 3 are closed, and the sliding door leading to the grab-pit is opened. The waggon-tips Nos. III. and IV. discharge on an inclined plane, on which the coal slides down to the grab-pit, shown in fig. 5. Above each of the grab-pits is a framing, 72 feet high, on which runs the travelling carriage, or crab, of an automatic grab. This grab, having a capacity of 4·25 cubic yards, raises the coal above the level of the top edge of the bunker. The travelling carriage then runs over the latter and the grab opens and discharges its contents into the bunker. Each of the two grab installations deals with 100 tons per hour. The travelling carriage or cab has a driver's platform and a 60 H.P. winding motor, as well as a 15 H.P. travelling motor. The rate at which the grab is raised is 115 feet per minute, and the rate of travel horizontally is 295 feet. From the bunkers just mentioned the coal transporter waggons, of 1·6 cubic yards capacity, running on fixed rails, are filled with coal, and pushed by hand to the coupling place, where they are automatically coupled to the rope by which they are drawn on.

It is well known that the transport of heavy materials is most effectively carried out by means of a transporter system, as the tracks readily pass round any obstacles, whether in a horizontal or vertical direction. Since the cost of the bearers or supporting framework is comparatively small, the length of the line is not of great moment. The storage yard could thus be a long way from the place at which the coal would be consumed, and the space under the track could be made use of for other purposes. In the case of the Obuda works, the laying out of the tracks was a very simple matter, owing to the local conditions; and the different tracks, as can be seen from the plan (fig. 1), could be all joined to a closed circuit. The tracks used for the storage of the coal are those marked B B on the plan, extending from the central power station to the producer station, and having a length of about 33,000 feet, in addition to the two bridges E and E¹ over the storage yard.

The driving machinery and the rope-winding apparatus in the

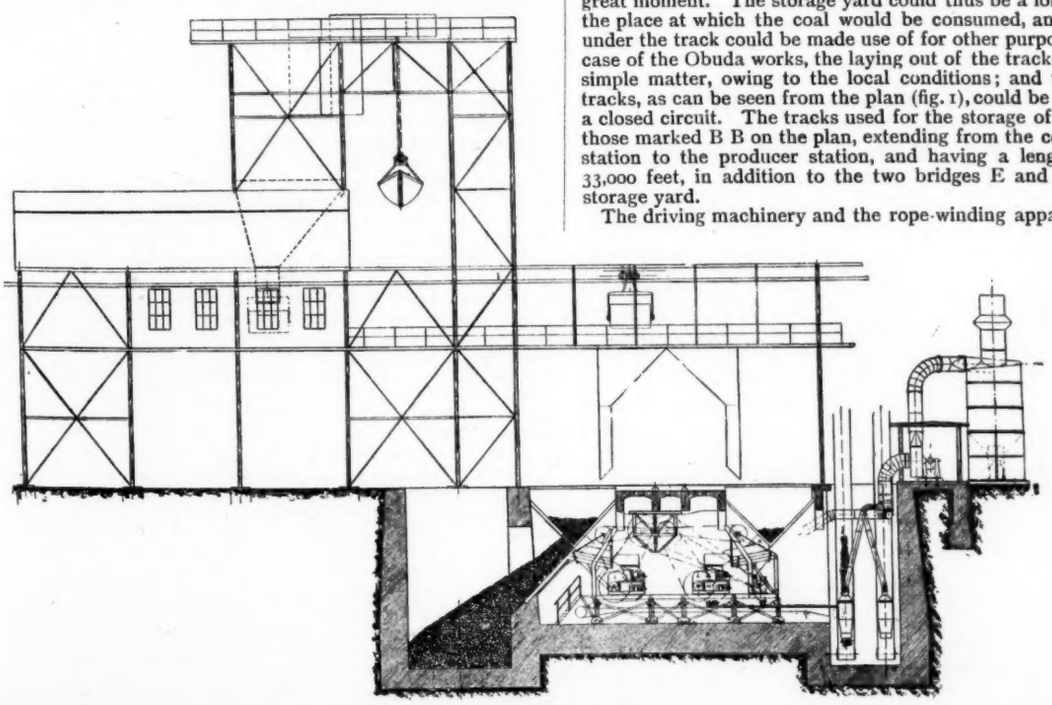


FIG. 3.

central station serve also for the tracks A A, 577·5 feet in length, and C C, 951·5 feet in length, which will be referred to later. For working the three tracks—of which any one can at any time be put out of action—there are two 60 H.P. motors, one of which is kept as a stand-by. The haulage rope, on leaving the central power station, runs over a corner pulley, 13 feet in diameter, and then along the storage yard to the bridge E. It then swerves back again from the bridge on to the girder framing, which divides the coal-store into two halves, passes over the corner pulley on the right at the end of the coal-store to the producer plant, and returns thence to the central girder framework. From the latter it returns over the bridge E^1 to the power station. The rate of travel of the rope is 40 inches per second.

The bridge from which the coal is discharged is moved by electric power, and is in the form of a part-flying crane. It stretches across the whole coal storage yard, and enables the waggons to be discharged at any desired part of the yard by means of deflecting blocks, which can be shifted as required. In the central power station the overhead track B branches off to the right to the coal storage yard, while in front the track C leads to the boiler-house, and at the back there is the track A leading to the Danube Quay. In front of the power station is one of the grab installations, and in the roof of the building are accommodated the intermediate bunkers from which the waggons are filled.

Picking up the Coal from the Storage Yard.

For picking up the stored coal there are two grabs, which travel on the bridges over the storage yard and have each a capacity of 60 tons per hour. By means of the grabs the coal can be picked up from any part of the storage yard, and, through the intermediate bunkers in the middle of the bridges, can be put into the transporter waggons. The filled waggons are then coupled to the rope which draws them to their destination.

Supply of the Carbonizing Plant with Coal, and of the Producers and Boiler Plant with Lignite.

The direct supply of the carbonizing plant with coal which has just arrived has already been referred to, and it only remains to explain that, when coal which has been in store is used, the transporter waggons filled with it from one of the two bridges over the storage yard are shunted at the central station from the track B to the track C. On the latter they are discharged into a funnel, through which the coal falls into the bunker above the coal-breakers, and, after passing through the breakers, it is taken, in the manner already described, by conveying bands to the coal-tower of the carbonizing plant.

The bunkers of the producer plant are filled by means of a conveyor which is fed by a bunker, shown in the plan (fig. 1), into which the transporter waggons, filled with brown coal by the grab or else on one of the bridges E or E^1, are discharged. The boiler-house is supplied by bringing the waggons filled with brown coal at one of the places just named to the central station, and there passing them on to the track C, which leads over the bunkers of the boiler-house into which the transporter waggons are discharged. It should be mentioned that the transporter plant has been designed for a capacity of 200 tons per hour, and that automatic weighing machines have been introduced at suitable places on the track, in order to determine the quantity of coal used in different parts of the works.

The transporter waggons are fitted with a crank lever which is pressed back by the tongues which serve for discharging the coal. The waggons, being suspended eccentrically, are tipped and thereby emptied. The central power station is at the back of the whole installation, together with the grab, in front of which is the bridge E^1 on the storage yard. Issuing from the front of the power station is the crane track constructed as a fixed bridge and carrying the running tracks for the waggons. On the right is the second bridge over the storage yard, and in front of it the southern corner station from which the transporter track leads to the left to the producer plant. In front of the latter is the filling funnel for the two conveyors, as well as the framing which supports the latter. To the right of the producer plant is the grab station and one of the waggon-tips. The coke conveying plant is to the left of the producer installation. The whole installation has been designed so that the most diverse combinations of the work of the different operating sections are possible. The transporter waggons travel at the rate of 40 inches per second, at distances apart of 56 feet.

COKE CONVEYING PLANT.

Conveying to Breakers and Sorting Plant.

The coke, as expelled from the carbonizing chambers by the machinery, falls through the coke-quenching chamber in front of the settings into the quenching waggon, which travels below the latter, and is there quenched with water. The coke-quenching waggon, driven by electricity, then travel over the bunker constructed in front of the breaking and sorting plant, and discharge their contents into it. The quenching waggon holds about 7 tons of coke. The emptied waggon then returns to the next chamber in order to receive the charge from it. The coke-breakers are beneath the bunker, and discharge on to a conveyor which runs below them. This conveyor raises the coke above the sorting plant.

Each of the two coke-breakers has a capacity of 30 tons per hour, and is of similar construction to the coal-breakers already described. Each conveyor has a capacity of 60 tons per hour. One set of plant suffices for present requirements, and the second serves as a stand-by. The arrangement of the bunker, and breaking and sorting plant is shown in fig. 4. The delivery shoots from the bunker to the coke-breakers are kept in constant movement, in order to prevent the bunker outlets from becoming blocked; and they have rocking screens through which coke breeze falls and reaches the conveyor without passing through the breakers.

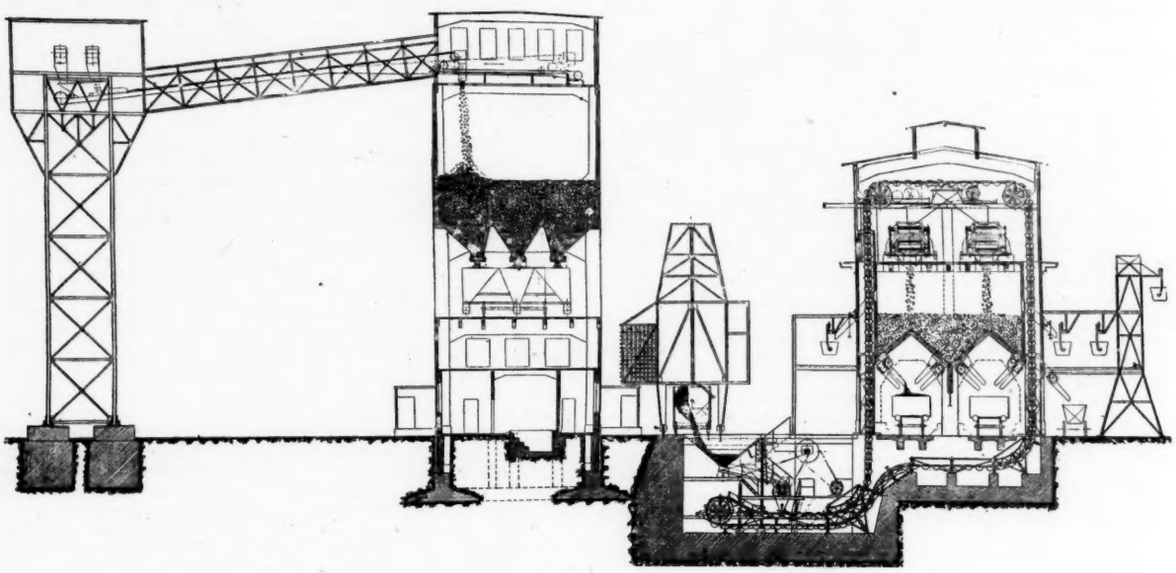


FIG. 4.

There are four sorting plants, each of 30 tons per hour capacity. In place of the usual swing grids the sorting plants have circular riddles, slightly inclined, and given a circular movement by an eccentric. Different shoots deliver the sorted coke into separate bunkers below them. The apparatus divides the coke into four classes—viz.: (1) Large coke exceeding 2 inches; (2) nuts from $\frac{4}{5}$ inch to 2 inches; (3) hazel nuts from $\frac{1}{3}$ to $\frac{2}{3}$ inch; and (3) breeze less than $\frac{1}{3}$ inch in size. The sorted coke is drawn off from the different bunkers through shoots, either into transporter waggons, in which it is taken to the places where it is required for use, or it is conveyed to the storage yard. Beneath the building containing the sorting plant two railway lines pass, on which waggons, moved by the rope-shunting installation, can be filled from shoots in the bottom of the bunkers. In these lines there are four weighing machines for loads up to 30 tons; and the waggons are here made up into trains which are drawn by a locomotive to the works' railway station. On the side of the building facing the coke yard there are other shoots which are used for filling carts.

Transport of the Sorted Coke.

The coke which is not loaded direct into railway waggons is drawn off into transporter waggons, by which it can be conveyed

to either of the following destinations—viz.: (*a*) The bunker of the coke-retailing depôt; (*b*) the bunker of the producer plant; (*c*) the bunker of the boiler plant; (*d*) the loading quay on the foreshore of the Danube; and (*e*) the coke-storage yard. For these purposes another transporter track, about 2795 feet in length, marked on the plan (fig. 1) as D D D, has been provided. It is brought into communication, through appropriate switches, with both the transporter track B and the track C. Communication with the track B is provided in case there should be a breakdown on either track, in which case their functions could be reversed. The connection with the track C admits of the transporter waggons passing to the boiler-house, or through the central power station on track A to the Danube Quay. In both cases the switches are hand controlled.

In the power station there is a 20 H.P. motor, used for this track only and the rope-winding apparatus. The haulage rope extends from here, along the framing which supports the transporter rails, up to the bridge G which extends over the whole storage yard. The framing supporting the transporter rails also serves as a travelling track for this bridge, which is in the form of a part-flying crane. From the bridge the haulage rope turns round and passes through the coke retailing depôt to the producer plant, where it runs round a terminal pulley on the crane-track supports, and so back to the power station. In front of the coke-sorting house, both the rope and the transporter rails are brought

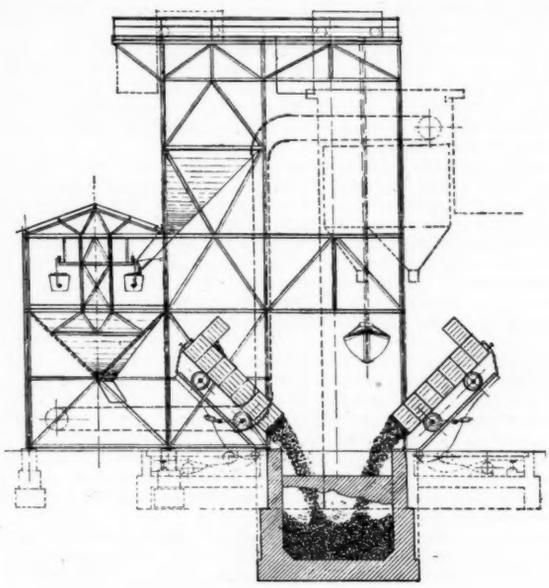


Fig. 5.

to a low level, in order to reduce the height of the building. The transporter waggons, filled under the two longer sides of the building, are shifted by hand on to the coupling station, where they are coupled automatically to the haulage rope, and are then hauled to the power station, where they are automatically released from the rope. They are then transferred by hand to the track leading to their destination—viz., the track C if they are to go to the boiler house, the track A if they are to go to the Danube and back to the track D if the coke is to be discharged in the coke-storage yard, in the bunker of the retailing depôt, or at the producer plant. The waggons, which are tipped and emptied by tongues projecting at the required spots, then return to the sorting plant for refilling.

Transport of Coke from Store to Different Destinations.

The coke is lifted from the store yard by means of a travelling carriage or cab. In order, however, to avoid damage to it, a grab is not used, but a flap-bottomed skip, filled by hand. This plant, like the rest of the conveying plant, has a capacity of 60 tons per hour. The crane bridge over the coke yard is moved by a 20 H.P. motor at a speed of 40 feet per minute. The hoisting motor of the crab is of 30 H.P. and hoists the skip at a speed of 141 feet per minute; while the travelling motor is of 10 H.P., and gives a speed of travel of 492 feet per minute. The filled skips are elevated by the crab and brought over the filling bunker on the bridge. They are then opened like the grabs, and their contents discharged into the bunker. The transporter waggons filled from this bunker are coupled automatically to the rope and sent to their destination in the manner already described. A slide, which can be shifted lengthwise along the bridge to the place where coke is being shot in the storage yard, serves as a gauge to prevent it being piled to too great a height. To the right is the filling bunker with a platform beneath it, on which the two men in charge of the filling operations stand. Both to the right and left of the bunker are arranged the automatic coupling and uncoupling arrangements.

In front of the shoots of the coke retailing depôt there are six automatic weighing machines, by means of which carts can be loaded with exactly the desired weights of coke. At the other side of the depôt there are ordinary shoots, and the carts filled from them are weighed on a weighbridge at the gate. In the bottom of the bunker there are other shoots which are used for filling sacks with coke.

Conclusion.

The coal and coke conveying and handling plant was supplied by various German and Hungarian firms. The coal-breaking plant and band conveyors attached to the carbonizing plant cost about £18,750, exclusive of the coal-bunkers. The rest of the coal and coke conveying plant cost about £62,500. The coke breaking and sorting plant, including the reinforced concrete building, cost about £21,667. The contracts were placed at the end of the year 1911 and the beginning of 1912, and work upon the foundations started in the spring of 1912. Notwithstanding delay in the delivery of the structural steel, the work was completed in time for the gas-works to start operations on Oct. 16, 1913. As regards operating expenses, the following figures are given:

(1) For tipping a 20-ton waggon, two men and 0·46 unit of current (alternating, 190 volts, 50 periods) are required; so that the cost of discharging a waggon is 2·1d., or about 0·1d. per ton. With smaller waggons the cost per ton is correspondingly increased.

(2) Breaking the coal and conveying it to the coal-bunkers of the carbonizing plant at a height of 82 feet requires three men and 36 kilowatts per hour. The cost works out at 0·43d. per ton.

(3) The putting of the coal into store costs 0·9d. per ton, and eleven men are required for the work. The picking-up of the coal from the store-yard and conveying it to the place where it is required for use costs the same. Thirteen men are, however, required on this work; while the consumption of current is rather lower.

INTERNATIONAL GAS CONGRESS AT SAN FRANCISCO.

Opening Address of Dr. Alex. C. Humphreys, the President—Delivered Tuesday, Sept. 28.

As the representative of the gas societies of the United States, it is now my duty to declare that the International Gas Congress of the Panama-Pacific International Exposition is in session.

It is my privilege first to extend a most sincere and hearty welcome to all in attendance. And I speak for all those I represent, when I say that we of the United States are keenly appreciative of the presence of our brethren from foreign countries. This International Congress of the gas men of the world has come to be limited in some degree through the unhappy conflict which is now raging over the greater part of Europe, while involving Asia, Africa, Australasia, and the Isles of the Pacific. It is most gratifying, in the face of this interference, so grave in character, that this congress as to attendance, and particularly as to contributions of papers, is still of international scope.

THE WORLD WAR.

When the exposition was planned, and even later when the congress was suggested, the man who had ventured to suggest as even a possible interference a war involving all the great powers of Europe would have been pronounced a rank pessimist, if not a madman. But the impossible, as it then appeared, but which with the records even so far disclosed we can now see was inevitable, has come to pass. And thus many of our co-workers from abroad, whom we had hoped to welcome at this time, are now arrayed against each other in what threatens to be a death struggle. In this frightful happening, our sympathy goes out to all who have been innocently dragged into this barbaric war by the acts of others.

Let us, then, first pause to express the hope that out of this world-war—the most shockingly destructive and horrifying within the knowledge of man—there may result finally some measure of compensating good for the peoples as a whole, and particularly greater security for those who are anxious to live at peace with their neighbours and to exercise the right of working-out their own destinies free from outside pressure and interference. Let us at least cherish the hope that the cruel maiming and killing of combatants and non-combatants does not indicate a retreat from the struggle for a higher civilization—a cause to which we, particularly as engineers, are committed. This hope is encouraged as we hear of the many acts of self-sacrifice and heroism on the part of the innocent participants in this bloody struggle. May we not wisely recognize the present-world conditions as a deserved rebuke to that spirit of boastfulness and self-sufficiency which

regards all things and ideals of the present as superior to those of the past. For our own safe guidance, we are being reminded that in the administration of this world's affairs, we still have to deal with the same human nature, with all its primitive weaknesses, with which the peoples and governments of the past have had to deal. This is a lesson that we of the United States particularly should take to heart.

With regard to engineering, it is disconcerting to recognize, as we must, that the wonderful advances in science made during the last century have greatly increased the horribleness of war. This being the case, we are, I fear, forced to the conclusion that those who, with consistent and persistent efficiency, avail themselves of the teachings of engineering science to prepare for war, possess a controlling advantage over those who—recognizing, as we all do, the material and spiritual benefits of peace—are content to depend for their protection on the good will and forbearance of those who have the power, if not the avowed purpose, to enforce their wishes, demands, and even their so-called ideals. Those who are unprepared are thus left at the mercy of the prepared.

There are no people of the world better situated geographically than we of the United States to pursue untrammelled our vocations and avocations of peaceful living. But this advantage is only comparative, and does not guarantee to us immunity from war's bondage. "Eternal vigilance is the price of liberty." But knowledge of a threatened peril affords in itself alone no protection from tyranny.

THE PEACEFUL ARTS.

With all the misery surrounding us, it is fortunate that our immediate duty is to devote ourselves for the next few days to the study of the questions involved in one of the peaceful arts—artificial illumination by gas. We are fortunate that we can take up the study of our many problems free from the fear that the product of our knowledge, experience, and energies might be applied to the injury and destruction of our fellows.

With a sense of relief from direct participation in the trials, miseries, and sorrows of our fellows, we must also realize that we are involved through the ties of brotherhood. It is for us to do all that lies in our power to alleviate the distress so much in evidence abroad. When we think of the barbarities which are now chargeable against members of the human family, it is some consolation to reflect upon the noble, self-sacrificing work of relief being done by non-combatants. In this work, the people of the United States have stood out in the front rank; and let us all show by word and deed that we appreciate there is no retreat from this assumed duty until the war and its immediate effects are things of the past.

RESPONSIBILITY OF THE ENGINEERING PROFESSION.

Not only in the direction of charity does there rest upon us a grave responsibility, but also in making preparations, to the limits of our means and powers, to adjust our industries to supply those products which the countries now at war will be unable for some time after peace is declared to create for themselves. This is a responsibility which rests with particular weight upon the members of the engineering professions; for it is upon engineering in its many branches that the industries depend. I say all this in no mercenary spirit; for the more efficiently we are prepared to supply the peoples abroad, the lighter can be made their financial and physical burdens during the period of recuperation.

Notwithstanding the events which overshadow us, we must meet our own direct responsibilities. It is then encouraging that so many of us have been able to meet here, to exchange our views and experiences with respect to that part of the world's work for which we are more specifically responsible. In connection with our discussions, we must not forget that those who have been unable to meet with us are to be given the opportunity to study the records of our sessions. This places upon us all a responsibility which, I am convinced by a long and wide experience, is not sufficiently appreciated by the membership of societies formed for the promotion of specialized study. The transactions of these societies in many cases fail to disclose adequate discussion—thus leaving the questions involved answered incorrectly or unanswered. In our technical meetings too many men sit silent when they have valuable matter to disclose—this sometimes from modesty and sometimes from indifference. Others, on the other hand, are too ready to occupy the floor in presenting irrelevant or misleading discussions. It is the activities of the latter which increase the responsibilities of the former. Let us, then, be diligent and painstaking at this time to develop "the truth, the whole truth, and nothing but the truth."

The foundation for our business is one branch of engineering—a branch which is broad in its scope, involving as it does much which is ordinarily classified as civil, mechanical, mining, chemical, and even electrical engineering. Combine this breadth of scope as to engineering with the complex business and politico-economic questions which present themselves for our solution, and we must realize that we carry our full share of responsibility as citizens and members of the great human family.

MEETING COMPETITION.

So, coming to our immediate work, we have to bear in mind that we have many problems to solve and many difficulties and dangers to meet. In the electric light we have a competitor which has grown stronger year by year. Let us not fail to recognize that this competitor has been guided by financiers, engineers, and business men of the highest attainments. Particularly, has the engineering profession here contributed of its best. Let us not deceive ourselves, therefore, as to the facts; but let us face the facts and so be the better prepared to demonstrate where, when, and how gas can be best and most economically employed. We are told, "Necessity is the mother of invention;" it is also the spur to the most intense and persistent effort. One thing we may certainly agree upon: We cannot afford to neglect any opportunities for betterment which present themselves or can be discovered.

Here in the United States, in common with our electric light competitors, we have other troubles and dangers to meet and overcome. Particularly have we, in common with all the public utilities, to meet the present evil of over-regulation. Perhaps our friends from abroad are in a position to sympathize with us in some degree.

SUPERFICIAL LAW MAKING.

The necessary regulation suggested by changes in methods of living since the time of Jefferson do not call for the placing in the hands of a single department the power to exercise the three functions of government: The legislative, the executive, and the judicial—the three functions which that "most conspicuous apostle of democracy in America," as he has been styled, declared must be kept separate. To this same principle the party now in power most specifically committed itself in the last presidential convention platform. Here in the United States we are all too ready to enact new laws to control, to cure, or to eliminate the old faults, weaknesses, and sins of humanity. Over 60,000 new laws put upon our Federal and State statute books in five years necessarily mean superficial lawmaking and ineffective enforcement.

Regulation by Commission has, no doubt, come to stay; but it has already been over-developed. And here it is alarming to find that the demand is being made by the Interstate and other Commissions for enlarged powers.

Although this feature of our government has come to be more and more in conflict with our boasted traditions, and particularly during the last two years, it is the exception when a voice is raised against this revolutionary departure from a fundamental feature of our form of government. Not a small part of the responsibility for this unfortunate condition must be borne by the owners and managers of the properties—including bankers, business men, small investors, and the officers of the companies, particularly the latter, for they are, or should be, the best informed as to the facts and the questions involved. All directly concerned should be prompt, fearless, diligent to correct misstatements and misinformation and to disseminate the truth, and all done openly and above board. They should also be courageous and untiring in their resistance to persecution and confiscation when it parades under the cloak of regulation.

The constitution of the United States is supposed to guarantee its citizens against the taking not only of life but of property without due process of law. In too many cases this guarantee had been repudiated.

Let us not be put out of countenance because those who, either through ignorance, misdirected zeal, or evil intent point to the misdeeds of some as a reason for punishing all. "Let him who is without sin cast the first stone." Then no stones would be cast. But this is not our defence. We claim that, as a general proposition, our business is carried on with a due regard for the rights of all others concerned. In this respect we invite comparison with those of other vocations, and particularly we invite comparison with professional reformers and ear-to-the-ground politicians.

THE SPIRIT OF CO-OPERATION.

Let us be keen to do full justice to all those with whom we deal; let us be prompt to co-operate with the authorities in all their efforts looking to improvement; and having met our full responsibility to those we serve, let us be courageous, diligent, indefatigable in protecting our properties against unfair control and ourselves against unfair and slanderous aspersions.

Our programme is full and rich, and we can now best do our duty to our principals and to those we serve by giving undivided attention to, and a complete discussion of, the papers that are to be presented.

It devolves upon us who reside away from the Pacific Slope to do our utmost to make this congress an unqualified success, if for no other reason than as a recognition on our part of the work of preparation done so generously and efficiently, and in the face of great obstacles, by the officers and members of the Pacific Gas Association and those associated with them.

PRESIDENT'S ADDRESS—Mr. E. C. JONES, of San Francisco.

The year 1915 is a period of unusual happenings; and the American Gas Institute, in holding its tenth annual meeting in San Francisco, on the shores of the Pacific Ocean, is justifying its claim of including the whole United States in its field of activities. This is the first time in the life of our industry that an American Gas Association has held a meeting west of Denver; and if we think for a moment, the reason becomes clear.

Ours is a busy fraternity, dealing with the manufacture and distribution of a product still mysterious and little understood by the public; and it is only the unceasing vigilance of the gas engineer which ensures uninterrupted service. The active, alert men of the gas business cannot travel far from the scene of their duty; and a trip to California is an event of a lifetime. To fully appre-

ciate the distance travelled by most of our members to attend this meeting, it is necessary to study a map of the world.

San Francisco is nearly 3300 miles from New York. If the points of a pair of compasses are placed on New York and San Francisco, and the distance is used as the radius of a circle with London as its centre, the circle includes the whole of Newfoundland, part of Labrador, the whole of Greenland, all of Europe, including a portion of Siberia; it reaches beyond Suez, and embraces about one-fifth of Africa. In other words, if a Gas Congress were held in London, it could be reached by everybody in Europe, Northern Africa, Greenland, and Newfoundland, without travelling any farther than from New York to San Francisco. These facts are rather appalling; but they are more than equalled by the enthusiasm and fraternal spirit which bring this gathering of gas men together.

Our California is an empire in itself; and with its more than 100,000,000 acres of land, it would hold the entire population of the world with less than sixteen persons to an acre. I can see in the future an increasing industrial, agricultural, and commercial importance which will bring California so near to the east that Gas Institute meetings in San Francisco will be necessary and frequent. The gas men of the Pacific Coast appreciate the honour of having this meeting in San Francisco, and it will redound to the credit of the Institute for proclaiming that its title of "American" covers the United States from ocean to ocean.

An innovation in the Institute work was the appointment of a Committee on Collective Gas Exhibit for the Panama-Pacific International Exposition; and had it not been for the effective efforts of your Committee, our industry would not have been represented in this great world's exposition.

The Collective Gas Exhibit occupies 10,000 square feet of floor space in the Palace of Manufactures, and is illustrative of the manufacture, the distribution, and the uses of gas. The exhibit is lighted by gas, and is a convincing exponent of the economy and efficiency of gas illumination. The Grand Prize, which is the highest award in the gift of the Exposition, was awarded to the Collective Gas Exhibit; and on the special exhibitors' day of the Manufacturers and Varied Industries Palaces, the first prize, a silver loving cup, was awarded to the Collective Gas Exhibit for the most attractive and best decorated exhibit in the Palace of Manufactures. This unqualified success of an Institute Committee dispels any unspoken thought that the Institute is not keenly alive to the growing importance and boundless possibilities of the gas business.

Your President urges a close study by the captains of our industry of the report of your Public Relations Committee. This report discloses the fact that the work of this Committee in the education of the public mind along economic lines has advanced the cause of gas in the betterment of service to the public, and the saving of waste to the manufacturer by intelligent regulation of the quality of our product.

The work of this Committee, together with the constructive and standardizing work of your Technical Committee, and the various co-operating Sub-Committees, places the American Gas Institute in the front rank of national engineering societies, and enhances the value of membership. A continuation of this work should be fostered and appreciated by the gas undertakings of this country to such an extent that our membership should be largely increased, and the Institute become a clearing-house for the settlement of questions of policy relating to all departments of the gas business. This leads to the thought of the wisdom of continuing the life of active and important Committees engaged in progressive investigations.

On account of our participation in the International Gas Congress, the proceedings of our tenth annual meeting will consist mainly of the reports of Committees; and your Board of Directors has chosen this opportunity to prepare an index of the proceedings of the past decade covering the life of the Institute, which will add materially to the value of our published "Proceedings."

Your President has spent forty years of unfaltering devotion to the gas business, and thirty-six years to Association work; and during that time—filled with its failures and successes, menacing competitions, and triumphant advancement—no fear of the future glory of the gas business, nor loss of faith in its eventual predominance, has ever crept in.

The future of the gas business looks very bright. We are the purveyors of a commodity which has become a public necessity, and before us lies a field of opportunities. We are dealing with British thermal units; and with a knowledge of their application, gas should be pre-eminent where heat, power, or illumination is needed in domestic and industrial economy.

The success of our business depends upon the individuals engaged in its various departments; and a grave responsibility rests upon the men who are the framers of its destiny. An unshaken belief in the efficiency and economy of gas for all purposes is necessary to a permanent development of the business; and the agents must be gas men, not gas and electric men. Gas and electricity cannot be well and impartially served by the same hand.

While new extensions are necessary to expand our business as communities grow, the greatest and most fruitful field will be the development of new uses for gas among present consumers. As men must be the potent factors in the upbuilding of our industry, it rests with the Gas Associations of our country to educate the men; and therein lies a wide scope of usefulness for the American Gas Institute.

Death has taken eight of our members during the year; and it has been the custom to record the death of a member by inscribing his name and the date of his death on a memorial page in the "Proceedings." While I do not approve of the ordinary eulogistic obituary notices, it seems to me that the dignity of membership in the American Gas Institute calls for more than passing notice, when it is terminated by the hand of death. I therefore recommend for your consideration the appointment of a Committee on Necrology, whose duty it shall be to prepare biographical notices of all deceased members for publication in the "Proceedings." These notices will have historical value; and if a man's life work has been of sufficient importance to recommend him to membership in the Institute, then a record of his work should be a valuable addition to the history of our industry.

CONTACT OF LAW AND ENGINEERING.

So far as was indicated by remarks made in the subsequent discussion, there appeared to be general agreement among those present—the attendance would not have been looked upon as a large one in ordinary times, but under the existing conditions (absences elsewhere, press of work, and the difficulty of getting about the streets at night) it may be said to have been fairly satisfactory—with the main suggestion put forward in a paper read on Monday of last week before the Society of Engineers, on "Law and Engineering—Some Points of Contact."

The reader of the paper was Mr. Sydney G. Turner, Barrister-at-Law; and the suggestion referred to as having been favourably received was that the close connection which exists between law and engineering would amply justify the establishment of some periodical meetings, similar to those of the Medico-Legal Society, at which lawyers and engineers could discuss the many subjects which are of mutual interest. Some idea of how wide the range of this subject is was afforded by the paper, although it was admittedly impossible to deal with them all. In the unavoidable absence of the President (Mr. Norman Scorgie), the chair was taken by Mr. Percy Griffith, who, before inviting criticism of the paper, announced that this particular point had been already considered by the Council of the Society; and it had been unanimously decided that, should any opportunity arise for arranging such meetings, the Council would welcome the idea. That was to say, they agreed with the utility of the suggestion.

Mr. Turner quoted, in his opening remarks, from an introduction written in 1911 by Lord Justice Fletcher Moulton (as he then was) to Mr. L. W. J. Costello's book entitled the "Law Relating to Engineering." One part of this was: "The profession of an engineer involves much more than mere engineering knowledge or even executive skill. In a large proportion of the matters in which he is consulted, he has the responsibility of giving advice; and this advice often relates to acts in which the rights of third parties are directly or indirectly involved. This consideration alone would make it desirable that he should have a sound knowledge of such branches of the law as bear upon the questions he has to resolve. But his need of clear legal conceptions does not depend on this alone. He has not only to administer, but often to frame, contracts of a character which, beyond doubt, renders them the most complicated of any that have to be interpreted and pronounced upon by our Courts; and their nature is such that he can only pass on the responsibility to professional lawyers to a small extent. The rest deals with matters so technical that it must remain in his hands." Mr. Turner, knowing from experience the needs of the other side, added to this the assertion that, if it was necessary for the engineer to possess some legal knowledge for the proper exercise of his profession, it was no less necessary for the lawyer who was conducting a technical case to have at least such a "bowing acquaintance" with engineering as to enable him intelligently to cross-examine the expert witnesses on the other side.

In the course of his paper, the author made as wide a survey as was possible in the time at disposal of the field of engineering practice, with a view to giving illustrations of some of the more important points of contact between law and engineering. First taking those common to every branch of engineering, he dealt with expert evidence; remarking that, though as a general rule the mere opinion of an individual is inadmissible as evidence of a material fact, there has long been an exception in favour of the admissibility of the opinions of skilled witnesses, whenever the subject is one upon which competency to form an opinion can only be acquired by a course of special study or experience. Then allusion was made to arbitration, as being another ground upon which the lawyer and the engineer frequently meet; and, in this connection, the author pointed out that the position of the engineer as arbitrator is often one of peculiar delicacy and difficulty. Then the subject of contracts was touched upon; and as to these, it was truly said they constitute a field in which there is great community of interest between the lawyer and the engineer. The responsibility of the engineer in the giving of certificates is an important matter, which duly received attention in the paper.

The author then passed on to a brief consideration of the points where law touches the practice of each of the principal branches of engineering—dealing first, and at some length, with the various ramifications of municipal engineering. Mr. Turner expressed the opinion that there is perhaps no branch of engineering

practice which is so closely bound up with the law as that of municipal engineering. The municipal engineer is charged with the administration of a large number of complex Acts of Parliament; and he must be possessed of a sound knowledge of the general principles of the law and practice of local government. There are, for instance, sewers and drainage, private street improvement works, and matters relating to highways. When on the latter point, the author did not omit to mention the question of liability for damage caused by the use on roads of tar, and by the fumes emanating from creosoted wood paving.

In connection with gas, water, and electrical engineering, also, Mr. Turner showed that the lawyer and the engineer have much in common. Parliamentary procedure must be studied in all cases; and there are various special directions, which will occur to everyone conversant with practice in the different branches, in which community of interest exists to a greater or less extent between law and engineering. Suitable topics for discussion were stated to be the powers conferred, and obligations placed, upon gas undertakings by Parliament, the breaking-up of streets, the law relating to subterranean water and pollution, the damaging of cables, &c.

Several lawyers present, on the invitation of the Chairman, spoke on the paper. The first expressed the opinion that facilities for the meeting of lawyers and engineers for the discussion of matters of common concern, would, from the lawyer's point of view, be considered a very great advantage. Another said that he thought there would not be any risk attendant upon the engineer being in part a lawyer, provided he kept in mind that the knowledge of law he most required was that which would show him where he was on dangerous ground, and where he ought to obtain expert advice. A third stated his belief that a technical witness sometimes made the mistake of being too technical. The simpler and shorter he could make his answers, the more effective his evidence would be. On the engineering side, also, there were several speakers, one of whom agreed that the municipal engineer especially must be acquainted with the law connected with his profession; otherwise he would be bound to get his council into trouble.

Referring to subjects that might be jointly discussed, Mr. Percy Griffith remarked that the Water-Works Clauses Act of 1847 was ripe for revision, more especially in the direction of consolidation. Those who were concerned with gas and water legislation were aware of the Model Bill, which was one of the best things he (the speaker) knew of in connection with Acts of Parliament, in that it was subject to periodical revision and bringing up to date. He had great admiration for this arrangement; but the amendment of the Model Bill was effected to meet a particular practical emergency. That was to say, the law came and took into practical consideration the engineering side of the question, and made the law to meet a particular class of case. The Bill had been constantly amended and added to; and at the present moment he believed the Model Bill clauses were a great deal longer than any other clauses in a Private Bill. A suggestion which might reasonably be made at the present time was that the general law might be brought up to date, and displace the Model Bill for another period of years, and so save a great deal of trouble. Another interesting question with regard to water supply was the definition of "domestic supply." Then there was the question of standardizing clauses for contracts. These points had been already considered to some extent by the Institution of Water Engineers; and as Secretary of this body, he had had to study them. Those who were interested in any branch of engineering should make a point of collecting cuttings of legal cases referring to their branch, and reading carefully the arguments upon which the decisions in the cases were based.

A hearty vote of thanks was passed to the author for his paper.

TRAINING OF GAS ENGINEERS.

The "Gas Engineering" Course at the University of California.

In a recent number of the "Gas Age" (New York), Professor R. S. Tour, of the University of California, gave details of the course in "Gas Engineering" which has been instituted there, on the initiative of the Pacific Coast Gas Association. The following are some extracts from the article.

In his introductory remarks the author pointed out that the word "engineering" no longer has the narrow meaning it once had, and that the engineer, in his ever-increasing field of activity, has been called upon to operate and manage as well as to design and construct. Operating and managing require knowledge and training peculiar to the particular industry concerned. This directly points to specialization, which is inevitable for the engineer of the future; and, in the author's opinion, the gas industry offers opportunities for technically trained men which warrant the serious consideration of gas engineering as a profession by those who contemplate technical work as a career. The gas industry of the Pacific Coast has specially brought this out. Up to the last few decades illuminating gas was produced mainly from coal, in accordance with the generally accepted methods in use in other portions of the United States. But the scarcity and high cost of solid fuel made it an economic necessity that liquid fuel should be the raw material for the manufacture of gas. Gas engineers of the Pacific Coast had consequently to leave the well-trodden paths followed by their colleagues, and develop new methods and apparatus for making gas. So abundant has been the production of oil (from less than a million barrels in 1894 to nearly 100 millions in 1913), and so rapid the development of oil-gas manufacture, that the field has been very promising for properly trained men, in both the research and operating departments; and naturally the most desirable men would be those trained on the Pacific Coast, in the midst of the economic and industrial conditions existing there.

Holding this opinion, a Special Committee previously appointed by the Pacific Coast Gas Association reported in the year 1911 that it would be desirable for the University of California to establish a special course in "Gas Engineering." The Committee had a meeting with Professor C. L. Cory, the Dean of the College of Mechanics, and tentative plans for such a course were agreed upon. At the annual meeting of the Association in the autumn of the year, the report of the Committee was accepted, and voluntary contributions were asked for to maintain a fund for the course in the University.

At the annual meeting of the Association in 1912, the scope of the proposed course was discussed, and a paper on "Gas Engineering in American Universities," was read by Professor Robert Sibley, then of the Mechanical Engineering Department of the University; and the desirability of conferring a specific degree of "Gas Engineer" on the completion of the course was seriously considered. The specialized studies along gas engineering lines at other universities were investigated, especially the "Fellowship of Gas Engineering" maintained at the University of Michigan by the Michigan Gas Association—this being the most typical of the specialized courses given along this line at any university. However, it was thought that a similar fellowship in the University of California should not be offered, but that a course, available to a number of men, of a more general nature and of longer duration than a fellowship, would be more useful.

Subscriptions to the Association fund for "Gas Engineering" guaranteed a sum of $2700 per annum for a period of five years, to assist financially the development of a "Gas Engineering" course in the University of California. After a conference of the Special Committee of the Association with the Engineering Faculty of the University, it was decided to establish a chair of "Gas Engineering" and to equip a gas laboratory. It was also agreed that practising gas engineers on the Pacific Coast should deliver a series of lectures at the University in connection with the regular studies that would be offered in the course. It was kept in mind that it was absolutely essential to the success of the course that there should be lasting and continuous co-operation between the University and students on the one hand and the Association with its individuals on the other. The academic year 1912-13 marked the inauguration of a tentative course—the special feature being the lectures given by members of the Association. In the autumn of 1913, the author, who was at the time with the Consolidated Gas Company of New York City, and previously holder of the Gas Engineering Fellowship of the University of Michigan, was invited to the University of California; and during the ensuing year a lecture course on gas manufacture, known as "Gas Engineering 117," was instituted.

During the year 1913-14, the gas engineering laboratory was installed in the Mechanical Engineering building of the University. It is a combined chemical and engineering laboratory, and provides facilities for making any of the varied tests or experiments which might become necessary in a gas manufacturing or gas power plant. Beginning with the above-named year the following four-year complete course of study was outlined for those students who desired to specialize in "Gas Engineering;" this course being open to any students entered in the College of Mechanics. During the spring of 1915 the course was agreed to by the faculties of the Colleges of Engineering, and is now a distinct, well-defined, and separate engineering schedule leading to the degree of B.Sc. (in "Gas Engineering").

SCHEDULE OF STUDIES.

Note.—One unit represents one lecture or recitation per week for one semester of about sixteen weeks. Laboratory work is rated at three or four hours per week for each unit. The schedule for the first year is common to all courses in engineering.

FIRST YEAR.

	Units. 1st Sem.	2nd Sem.
Mathematics 3A–3B.—Algebra, analytics' geometry, and the first elements of the calculus—lectures and recitations	3	3
Physics 1A–1B.—Mechanics, properties of matter, and heat lectures, recitations, and laboratory	3	3
Chemistry 1A–1B.—General inorganic chemistry and qualitative analysis—lectures, recitations, and laboratory	5	5
Civil Engineering 1A–1B.—Theory and principles of surveying—lectures and recitations	2	2
Do. 1C–1D.—Practice of surveying and mapping—field work	1	1
Hygiene 1*.—Personal hygiene and first aid—recitations and lectures	2	—
Physical Education 1A*–1B*.—Gymnasium work	1	1
Military 1A*–1B*.—Military exercises on field	½	1
Do. 2A*.—Theory of military tactics	1	—
Elective	—	1
Total 35½ units =	18½	+ 17

* Required of all first year male students.

SECOND YEAR.

Mathematics 4A–4B.—Differential and integral calculus—lectures and recitations	3 ..	3
Physics 2C–2D.—Magnetism and electricity, sound, light, &c.—lectures, recitations, and laboratory	3 ..	3
Chemistry 6A–6B.—Quantitative analysis—lectures and laboratory	3 ..	3
Drawing 2A–2B.—Descriptive geometry — drawing periods	3 ..	3
Mechanical Engineering 106A.—Machine detail drawing—lectures and drawing periods	— ..	3
Do. 1A–1B.—Lectures and recitations:—		
Elements of steam engineering	3 ..	—
Elements of electrical engineering	— ..	3
Do. 8A.—Shop work in wood, pattern making, &c.—laboratory	2 ..	—
Military 1A†–1B†.—Military exercises in the field	½ ..	1
Do. 2B.—Theory of military tactics	1 ..	—
Total 37½ units =	18½ +	19

† Required of all second year male students.

THIRD YEAR.

Chemistry 8A–8B.—Organic chemistry—lectures and recitations	2 ..	2
Do. 9.—Organic chemistry—laboratory	— ..	2
Do. 111A–111B.—Physical chemistry, theory and applied—lectures and recitations	3 ..	3
Mechanics 102A–102B.—Engineering mechanics—lectures and recitations	3 ..	3
Mechanical Engineering 106B.—Machine design, theory and practice—lectures and drawing period	2 ..	—
Drawing 105.—Graphostatics, graphical analysis of stresses in engineering structures—lectures and drawing period	— ..	2
Gas Engineering 118AB.—Gas engineering—laboratory	1 ..	1
Mechanical Engineering 9A.—Shop work in iron, machine shop, &c.—laboratory	2 ..	—
Electrical Engineering 110A–110B.—Electrical machinery and construction—lectures and recitations	2 ..	2
Do. 110C.—Electrical machinery—laboratory	— ..	1
Civil Engineering 108A–108B.—Strength and resistance of materials—lectures and recitations	3 ..	2
Total 36 units =	18 +	18

FOURTH YEAR.

Mechanical Engineering 104A–104B.—Kinematics, theory of motion of machine parts—lectures and recitations	2 ..	2
Do. 104C–104D.—Kinematics, applications of—drawing periods	1 ..	1
Do. 103A–103B.—Hydraulics and hydraulic machinery—lectures and recitations	3 ..	3
Do. 105A–105B.—Engineering thermodynamics and heat-engines—lectures and recitations	3 ..	3
Gas Engineering 108B.—Internal combustion engines—lectures and recitations	— ..	2
Do. 117.—Gas engineering; manufacture of gas, construction and operation of plants, &c.—lectures and recitations	— ..	2
Mechanical Engineering 107A–107B.—Hydraulic experimental laboratory	1 ..	1
Do. 107C–107D.—Mechanical experimental laboratory	1 ..	1
Gas Engineering 120A.—Gas Engineering—laboratory (continued) not less than	1 ..	—
Do. 114.—Thesis—original contribution to gas engineering	2 ..	2
Electives	3 ..	1
Total 35 units =	17 +	18

Grand total units = 147.

SUMMARY OF COURSE.

	Units. 1st Year.	2nd Year.	3rd Year	4th Year.	Total.
Mathematics	6 ..	6 ..	— ..	— ..	12
Physics	6 ..	6 ..	— ..	— ..	12
Chemistry	10 ..	6 ..	12 ..	— ..	28
Drawing	— ..	6 ..	2 ..	— ..	8
Mechanical engineering	— ..	11 ..	10 ..	14 ..	35
Do. (hydraulic)	— ..	— ..	— ..	8 ..	8
Gas engineering	— ..	— ..	2 ..	9 ..	11
Civil engineering (including summer school)	9 ..	— ..	5 ..	— ..	14
Electrical engineering	— ..	— ..	5 ..	— ..	5
Incidental	6½ ..	2½ ..	— ..	— ..	9
Elective	1 ..	— ..	— ..	4 ..	5
Totals	38½	37½	36	35	147

The author thought it might be well to indicate more fully the scope and ground covered by the courses specifically known as "Gas Engineering," which must necessarily be limited in number. He did so as follows.

Gas Engineering 108B.—A lecture and recitation course of two hours per week on internal combustion engines. This course covers a theoretical consideration of the various cycles with their practical applications of to-day. Prerequisites: Mechanical Engineering 1A and 105A.

Gas Engineering 118AB.—A laboratory course of one afternoon per week throughout the year in the laboratories. The course covers complete analyses of gases; calorimetric determinations of solid, liquid, and gaseous fuels; photometric practice, &c. Prerequisites: Chemistry 6AB.

Gas Engineering 117B.—A lecture and recitation course of two hours per week, with a third lecture on alternate weeks given by outside gas engineers. This course covers the theory, methods, and processes used in the manufacture and purification of gas, including coal gas, water gas, and oil gas. The construction and operation of gas plants is considered in this connection. This course is supplemented by visits to neighbouring plants.

Gas Engineering 120A.—A continuation of 118AB, taking up some of the more difficult determinations, such as naphthalene, ethane in gas, free carbon in tar, condensation of tar particles, tar separation, &c. For this course the student may avail himself of the testing and experimental facilities of any of the neighbouring gas plants; and the extent of the work depends upon the desire and ability of the student.

Professor Tour offered the following observation on the course: It is evident that the "Gas Engineering" course, as outlined, is fundamentally a mechanical engineering course with a strong foundation in chemistry. This combination is what might be known as "Chemical Engineering." This is as it should be; the gas engineering profession involving mainly the application of chemistry and mechanical engineering. A few courses in gas engineering, as such, serve to illustrate this application. A mechanical-chemical engineer is the raw material from which a gas engineer is shaped. It has been the purpose and intent throughout to have the term "Gas Engineer" cover not only the manufacture of gas from fuels, but also the closely allied study of the direct generation of power from these fuels—that is, gas-power engineering or internal-combustion engineering. The rapid rise of the internal-combustion engine, especially where oil is easily available, makes the future of this branch of gas engineering exceedingly bright. This broad view of the term "Gas Engineering" makes the field less limited, and widens the scope of application of the energies of graduates. The course in "Gas Engineering" as outlined in the schedule goes into effect officially in the autumn of 1915. However, a similar outline has been used for students interested; and many have taken the various individual subjects coming under the title of "Gas Engineering." Some of these students have been sufficiently interested on graduation from their respective courses to obtain employment in the gas industry of the Pacific Coast. With the complete outline accepted as a distinct university course, there are many hopeful expectations for the future.

In conclusion, the author quoted some pertinent remarks on the value of a "Gas Engineering" course made by Mr. E. C. Jones, to the Pacific Coast Gas Association in 1911.

COKE FUEL FOR STEAM-WAGGONS.

Last Wednesday, a demonstration run from Wandsworth to Epsom, with a standard 5-ton "Foden" waggon and trailer, hauling a useful load of approximately 10 tons, was organized by the London Coke Committee, with the co-operation of the Wandsworth, Wimbledon, and Epsom District Gas Company. The chief object of the trial—which was attended by a very representative gathering of gentlemen interested in steam haulage, including the Secretary and Engineer of the Commercial Motor Users' Association—was to demonstrate the practicability of using gas coke exclusively as fuel on this type of waggon, without impairing either its capacity or efficiency.

The various inclines on the route were negotiated without stopping to change speed-gears; and a full head of steam was maintained at "blowing-off" pressure throughout the run of some 11 miles, which was completed in good average time. The quantity of coke used was ascertained to be 168 lbs.—a result which was admitted to compare favourably with average Welsh coal consumption. Considerable interest was shown in the trial, inasmuch as the possibility of using gas coke without any alteration to the fire-box, further than re-spacing the fire-bars, was proved, and that an alternative fuel was available while Welsh coal of good quality is practically unobtainable even at much enhanced prices.

The waggon used for the trial was one of a fleet which have been fired on gas coke over a long period, without any detrimental effect on fire-box, tube-plates, or tubes.

British Commercial Gas Association. — The fourth annual general meeting of the Association is to be held in the hall of the Royal Society of Arts, John Street, Adelphi, W.C., at 2.30 p.m. on Tuesday next, the 19th inst. The business to be transacted consists of the presentation of the report of the General Committee and the accounts for the period ending Aug. 31, an address by the President, Bailie Thomas Paxton, J.P., of Glasgow, the election of the President and Auditors for the ensuing year, and the consideration of a motion proposing the continuance in office until the annual meeting next year of members of the Executive and General Committees who would otherwise be now retiring.

Midland Association of Gas Engineers and Managers.—According to the programme for the autumn general meeting of this Association, which (as notified last week) will be held on Thursday at the Grand Hotel, Birmingham, the principal business will be an informal discussion on "Toluol Recovery," to be opened by Mr. Hubert Pooley, of Leicester, and a discussion to be introduced by Mr. W. H. Johns, of West Bromwich, on "War and Gas-Works Labour." It is not intended, however, to report either of these discussions in the Press. The only "open" business to be transacted—after the usual formal business, including the election of officers for next year—will be the reading of a paper by Mr. A. G. Leighton, on "Home Sales of Sulphate of Ammonia."

GAS FROM PEAT.

It was mentioned in the report given recently in the "JOURNAL" of the meeting of the Dutch Gas Association that several trials were intended to be made at the Hague Gas-Works as to the usability of peat as a gas-making material. These trials have been made; and "Het Gas" last month contained an article by Heer Brender à Brandis, the Engineer of the works, as to some results he has obtained.

Two sorts of coarse peat were tried—heavy lumps (A), and small lumps (B). The analyses in the laboratory furnished the following data:

	A.	B.
Moisture	25·00 per cent.	18·00 per cent.
Volatile matters	48·00 ,,	50·00 ,,
Sulphur	0·27 ,,	0·49 ,,
Ash	2·70 ,,	5·00 ,,

For the distillation of the peat a 10-feet horizontal retort was used—separated from the other eight retorts in the bench, so that it was possible to have the gas separately taken off, purified, and tested. The working temperature was the same as in the whole bench in regular use for the distillation of coal, as a lowering of the temperature was not advisable for the regular working of the other retorts of the bench.

In treating the peat, it proved impossible to have the retort charged with the full load of from 160 to 170 kilogrammes of the material, as the production of gas in the first period of carbonization was so excessive that the later parts of the experimental plant were not adequate in size for dealing with the great rush that resulted. The gas broke the water-seal, and in an instant the room where the experimental plant was situated was filled with peat gas. This necessitated the working exclusively with small lots not exceeding a hundredweight—a circumstance that must be remembered when gauging the results and the composition of the gas, as the volume of air in the retort obviously had some influence on the amount of nitrogen in the gas. The experiments with mixtures of peat and coal were made with normal charges of 160 kilogrammes.

The coke produced was weighed after quenching; and though a minimum of water was used, the coke from the peat was found to be more porous than that of gas coal, and so took more water. Furthermore the sulphur in the purified gas was estimated in the pure peat gas only, as in the mixed peat and coal gas the amount of sulphur depends mainly on the character of the coal used.

The question arose as to whether experiments with mixtures of coal and peat were necessary; and the question was answered in the affirmative, as the carbonization of peat mixed with coal lumps is certainly somewhat different from that in the case when the lumps of peat are exposed directly to the intense heat of the sides of the retort.

During the experiments no attention was paid to the production of tar and ammonia—more especially because the principal question to be determined was whether peat can be used in cases of emergency for the production of town gas.

EXPERIMENT I.—*Carbonization of Peat "A" only.*

The gas production per metric ton was 17,885 cubic feet; production of coke, 33 per cent. (wet); gross calorific power of the gas, 385 B.Th.U; specific gravity of the gas, ·670; sulphur in the purified gas, 9·7 grains per 100 cubic feet.

Composition of the Gas.

Carbon dioxide	15·6 volumes per cent.
C_nH_m	2·7 ,,
Oxygen	0·8 ,,
Carbon monoxide	21 0 ,,
Methane	13·7 ,,
Hydrogen	37·0 ,,
Nitrogen	9·2 ,,

The coke was very bad, consisting of small lumps resembling charcoal.

EXPERIMENT II.—*Carbonization of Peat "B" Only.*

The gas production per metric ton was 17,255 cubic feet; production of coke, 40·2 per cent. (wet); gross calorific power of the gas, 366 B.Th.U.; specific gravity of the gas, ·650; sulphur in the purified gas, 15 grains per 100 cubic feet.

Composition of the Gas.

CO_2	13·0 volumes per cent.
C_nH_m	2·1 ,,
O_2	0·7 ,,
CO	23·8 ,,
CH_4	12·1 ,,
H_2	39·6 ,,
N_2	8·7 ,,

The coke was of somewhat better quality than that of "A." It is usable in a stove. It is, however, very brittle and unfit for transport.

EXPERIMENT III.—*Carbonization of English Gas Coal Only.*

The gas production per metric ton was 10,097 cubic feet; production of coke, 76 per cent. (wet); gross calorific power of the gas, 558 B.Th.U.; specific gravity of the gas, ·401.

Composition of the Gas.

CO_2	1·9 volumes per cent.
C_nH_m	3·4 ,,
O_2	0·8 ,,
CO	7·1 ,,
CH_4	29·0 ,,
H_2	53 3 ,,
N_2	4·5 ,,

The quality of the coke was good—large lumps, with only a small proportion of breeze.

EXPERIMENT IV.—*Carbonization of 80 per Cent. of Gas Coal with 20 per cent. of Peat "A."*

The production of gas per metric ton was 12,635 cubic feet; production of coke, 69·2 per cent. (wet); gross calorific power of the gas, 472 B.Th.U.; specific gravity of the gas, ·476.

Composition of the Gas.

CO_2	6·0 volumes per cent.
C_nH_m	2·4 ,,
O_2	0·9 ,,
CO	10·9 ,,
CH_4	19·6 ,,
H_2	51·4 ,,
N_2	8·8 ,,

The quality of the coke was fairly good. The peat coke is distinctly visible, as small lumps resembling charcoal.

EXPERIMENT V.—*Carbonization of 80 per Cent. of Gas Coal and 20 per Cent. of Peat "B."*

The production of gas per metric ton was 12,728 cubic feet; production of coke, 69·7 per cent. (wet); gross calorific power of the gas, 495 B.Th.U.; specific gravity of the gas, ·541.

Composition of the Gas.

CO_2	6·6 volumes per cent.
C_nH_m	3·0 ,,
O_2	0·9 ,,
CO	13·2 ,,
CH_4	22·3 ,,
H_2	47·2 ,,
N_2	6·6 ,,

The quality of the coke was fairly good. In this coke also the peat coke was clearly distinguishable; but the lumps were larger and less brittle.

EXPERIMENTS VI. & VII.—*Carbonization of 90 per Cent. Gas Coal and 10 per Cent. Heavy Peat "A" and "B."*

The gas production per metric ton was (A) 11,672, (B) 10,976 cubic feet; coke production (wet) (A) 72, (B) 72·4 per cent.; gross calorific power of the gas (A) 543, (B) 544 B.Th.U.; specific weight of the gas (A) ·448, (B) ·469.

Composition of the Gas.

	A.	B.
CO_2	4·2 vol. per cent.	4·6 vol. per cent.
C_nH_m	2·9 ,,	3·0 ,,
O_2	0·9 ,,	0·7 ,,
CO	10·0 ,,	10·5 ,,
CH_4	25·1 ,,	24·9 ,,
H_2	53·0 ,,	51·9 ,,
N_2	3·9 ,,	4·4 ,,

In both cases, the quality of the coke was good, and no separate peat coke was to be seen.

The conclusion arrived at from these experiments and the resulting figures is that the carbonization of peat produces a large quantity of gas, but as compared to coal gas of inferior quality. In emergency cases, however, the limited addition of peat to gas coal may be of use, without the quality of the gas being lowered too much. The coke produced is a good workable kind; and the production of gas per ton of the prime material increases considerably. But the use of peat for gas-making purposes has more interest for gas-works with coal-gas benches and horizontal retorts only. For works with water-gas plants or with vertical retorts, the calorific power of the gas produced will be too noticeably lowered by the addition of peat gas to the mixed gas.

War Bonus Question at Oldham.—There appears to be a good prospect of a peaceful termination to the dispute between the Oldham Corporation and the Gas-Workers' and General Labourers' Union. The members of the Union in the employ of the Corporation had decided to come out on strike to enforce their demand for a general war bonus of 3s. per week, in place of the bonus of 2s., to those in receipt of less than 30s. which the Corporation are now paying. At a mass meeting of the members of the Union held last Tuesday, Mr. J. R. Clynes, M.P., the General Secretary of the Union, said that the notices tendered should have expired on Wednesday; and he read a letter he had sent to the Board of Trade, in which was set forth the claims made by the men and the refusal of the Corporation to agree to arbitration or to a further conference. In the letter he finally stated: "We now find it is claimed by the gas management that gas workers are munition workers, and that badges have been applied for for these men. In case your Department should take this view, and thereby regard the men as disabled by law from ceasing work, we conclude you will take the necessary steps to settle such claim by arbitration. If not, the men will cease work when their notices expire." On Wednesday, Mr. Clynes received the following telegram from Sir George Askwith: "I am making inquiries into the dispute, and shall be glad if you can arrange in the meantime to postpone further action." The strike notices have now been post-dated 21 days.

REGISTER OF PATENTS.

A New Fuel and Method of Making Same.

HICKMAN, T. M., of Wolverhampton.

No. 4214; Feb. 18, 1914.

For this invention—which was recently referred to in the "JOURNAL," Vol. CXXXI., p. 399—the patentee makes the following claim: "A process for converting by dry distillation carbonaceous matter possessing little or no coking properties into coked fuel of any desired hardness, which consists in incorporating with the carbonaceous materials, previous to or during distillation, natural or artificially prepared compounds of aluminium and silica, containing in chemical combination therewith alkalies or alkaline earths, magnesium, or iron (or such other metals which can take the place of iron and have the same effect in the combination), in such quantities as to obtain the property of great permeability and comparatively low fusibility, and of keeping the particles of the coke formed bound together."

The patentee proposes to artificially impart to non-coking carbonaceous materials the qualities which are naturally inherent in coking carbonaceous materials by incorporating with non-coking carbonaceous materials (such as coal dust, slack, and the like), prior to, or during, distillation, such substances as are naturally found in coking carbonaceous materials. These substances must have the property of being fusible, so as to thoroughly permeate the whole mass during distillation, and of binding together the particles of coke formed.

He has found suitable for this purpose natural or artificially prepared compounds of aluminium and silica containing, in chemical combination therewith, any or all of the above-enumerated substances. Among the natural materials, the following substances occasionally contain the particular compounds, and may be used as admixtures—namely, fire-clay or ball-clay, shale or red clay, gault, marl, or zeolites. Among the latter are included a number of minerals formed by the action of the weather from felspars, such as kaolin, from potash felspar, or calcareous zeolites (chabasite, phillipsite, desmine), or those formed from soda felspar, such as analcime and natrolite.

As it may not, however, be in all cases easy, he says, to find a perfectly adapted natural mineral, it is preferable to treat the natural bodies in such a way as to increase their fusibility and binding power. For instance, when an infusible clay has to be used, this can be converted into a fusible compound by treating it in a furnace or autoclave, with alkali or lime, whereby the respective compounds of alkali or lime with alumina and silica are formed. These compounds may then be treated in the furnace with a metallic salt or compound—*e.g.*, of iron—or a salt or compound of such other metal, which can take the place of, and has the same effect in the alumino-silicate compound as iron. The iron or like metal replaces the alkali or lime of the alumino-silicate compound in a well-known manner.

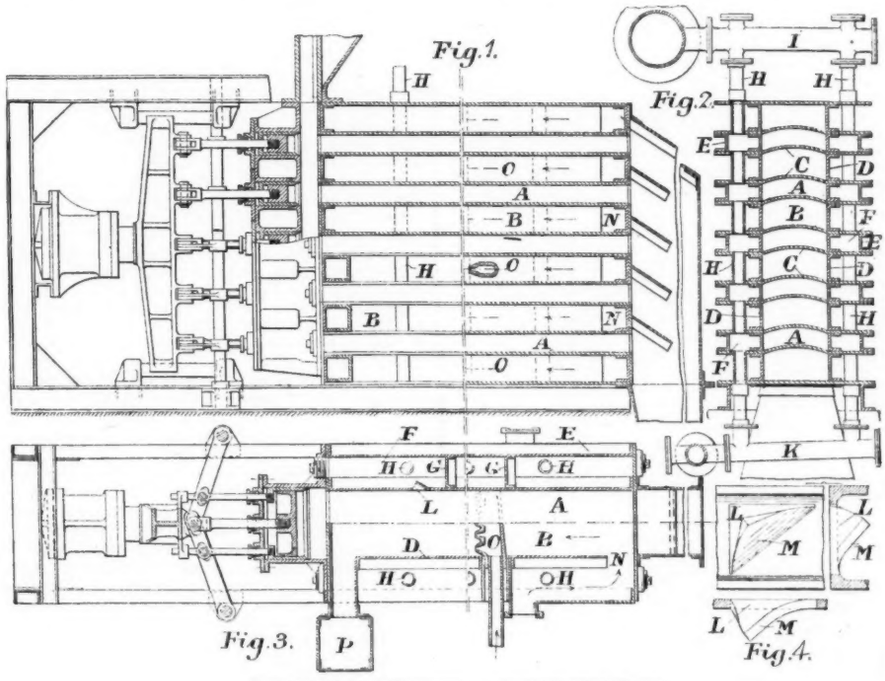
The density and hardness of the coke obtained will depend upon the proportion and the nature of the added material, and the degree of heat to which it is subjected.

The exact choice of the admixture to be used with the best effect depends naturally on the constituents of the mineral ash of the non-coking carbonaceous material, which differ very largely in various coalfields, and which must be ascertained by analysis. Thus if the ash of a non-coking carbonaceous material consists chiefly of a siliceous matter which is practically infusible, an admixture capable of producing a fluxing action will be required, such as is afforded by a compound of aluminium and silica containing iron in chemical combination therewith, and also containing in combination magnesium or alkali or alkaline earth. On the other hand, if the ash of a non-coking carbonaceous material consists chiefly of bases, a higher proportion of iron or other metal which can take the place of, and has the same effect in the combination as, iron, but a less proportion of alkali or magnesium, would be required in the alumino-silicate compound to be employed.

The hardness of the coke depends on the fusibility, permeability, and also on the contracting power of the admixture. Some of these compounds will contract, it is said, by as much as 10 per cent. of their volume on cooling.

In carrying the invention into practical effect, the ash constituents of the non-coking carbonaceous material are first ascertained by analysis; and according to the result of the analysis the selection of the binding substance is made, in the manner described. The carbonaceous material is powdered finely or coarsely as desired. If finely powdered, the material may be charged more compactly than in a coarse state. The binding material is then incorporated, either in a finely-powdered dry state or with the aid of water. According to the desired hardness of the coke, a proportion from 3 to 8 per cent. of the admixture is used. The mixture is then subjected to distillation—the coke being formed from the carbonaceous residue by the cementing action of the fused admixture, which becomes liquid, permeates the whole mass, and combines with the mineral matter contained in the carbonaceous material.

As the ash constituents of the carbonaceous material vary considerably, it would not be of much use, the patentee remarks, to give a typical example with exact figures. For the practical carrying out of the invention with the best results, it is therefore advisable, after having ascertained the nature of the admixture required by analysis, to adjust the exact conditions—*i.e.*, admixtures, temperature, and exact amount of coking, according to the result desired. Under suitable conditions—provided that the ash constituents of the carbonaceous material have been ascertained, and the choice of the admixture made in accordance with the directions given—it is possible to obtain the hardest and densest coke, suitable for metallurgical purposes, of the same quality as is manufactured in coke-ovens.



Duckham's Low-Temperature Carbonization Plant.

Carbonizing Fuels.

DUCKHAM, A. M'D., of Ashtead, Surrey.

No. 13,934; June 9, 1914. Redated Jan. 5, 1915.

This invention relates to retorts "in which the material to be carbonized is caused to travel through a region in which the temperature rises progressively in the direction of travel, or through zones of successively higher temperature, and the products evolved as gases or vapours are separately collected at successive points in the path of the material or at each zone." In this continuous process of fractional destructive distillation, it is said that "a better yield of the more valuable products is obtained." The process is "particularly applicable to the carbonization of coal and to what is known as low-temperature carbonization for producing a substantially smokeless fuel which burns more readily than an ordinary gas coke."

The patentee proposes to employ, in a bench of retorts, collecting chambers adapted to keep separate the volatile and other products of distillation from the zones of different temperatures—each chamber being connected to the correspondingly situated chambers in the retorts adjacent to it on either side. Finely sub-divided coal may be fed at frequent intervals into one end of a horizontal, inclined, or vertical retort so as to pass through it in a direction the opposite to that in which the heating gases are flowing around the retort. At suitable distances apart along the retort are openings in the sides, so formed that the coal in its more or less carbonized condition does not pass through. The retort being heated most highly near the end from

which the carbonized coal is discharged, while its temperature decreases progressively towards the end into which the coal is fed, each of the openings corresponds with a zone of different temperature; and the gases and vapours which issue from each opening can thus be collected separately. In the final (hottest) zone, the chief production of ammonia will occur, and here steam may be introduced.

Apparatus, as outlined above, for low-temperature carbonization is illustrated. Fig. 1 is a longitudinal vertical section; fig. 2, a cross section through the retorts and heating flues; fig. 3, a sectional plan; fig. 4, a detail view (enlarged) in plan and two sections in planes at right angles to each other.

The horizontal retorts A and heating flues B alternate with each other in a vertical column which is built up (as described in patent No. 13,935 of 1914) of steel plates C held between channel irons D. The plates are considerably wider than is necessary for forming the retort, and are connected at their edges by channel irons E to form a chamber F at each side of the retort and co-extensive with it. The chamber is sub-divided into a number of collecting chambers by transverse partitions G, each connected with those above and below by a pipe H. Thus there is a common passage for gases upwards from all chambers opening into zones of the same temperature to collecting mains I provided for each of the zones of different temperature, and for liquids downwards to the collecting main K. Other collecting mains and pipes connect with chambers having access to zones of other temperatures. Openings L in the walls of the retort afford passages for volatile products from the retort to the collecting chambers; the solid material being retained by the tongue M formed by cutting the metal along lines which meet at an angle to each other and bending outwards the piece within the angle, as shown in fig. 4.

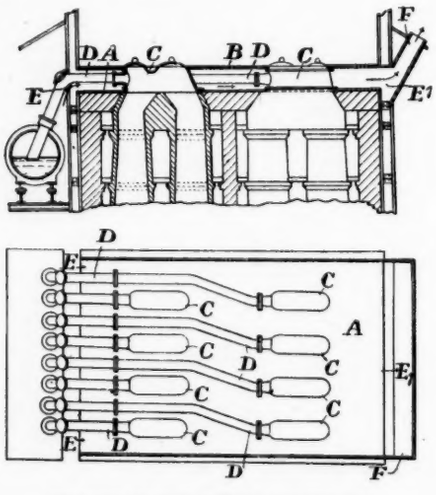
At the end of each channel iron that constitutes the side of a flue B which is nearer the discharge end of the retort, a portion is cut away to form an inlet N for air. The gas for the heating flues is supplied from a main to the burners O near the discharge end of the retorts which deliver gas in the same direction as the draught of air. The products of combustion leave the flues at the charging end of the retorts and escape to the flue P.

Vertical Gas-Retorts.

JULIUS PINTSCH AKTIENGESELLSCHAFT, of Berlin.

No. 16,199; July 7, 1914. Convention date, Oct. 11, 1913.

In the words of the patentees: "This invention relates to destructive distillation apparatus of the retort-furnace type—that is to say, of the kind wherein retorts are arranged in a vertical position within furnace chambers with their upper portions embedded in a top wall forming part of the furnace chamber surrounding each retort; the covers of the retorts and the branch pipes leading to the tar-pits being above the furnace, and over these a floor or plating being placed along which the attendants pass. The heat radiating from the retort heads or covers, and that produced by the hot gases passing through the pipes leading to the tar-pits, heats the floor plates to such an extent that it is practically impossible for the attendant to remain on the upper floor or passage for any length of time." The object of the present invention, therefore, is to provide means for producing and maintaining a current or circulation of air between the top of the furnace and the floor or passage used by the attendants. If the current cannot be produced by natural means (differences of temperature), auxiliary means—such as a blower or ventilator—may be employed.



Pintsch's Vertical-Retort Arrangement.

A vertical longitudinal section through the suggested apparatus for the purpose is given; also a plan in section.

The flooring or platform B for the attendants lies substantially flush with the retort heads or covers C; and some distance above the top A of the furnace, and between the platform and the furnace top, pipes D are arranged leading from the retort heads to the tar-pits. Between the furnace top and the platform a circulation of air is maintained; the air entering the space between the two surfaces at E and passing off again at E^1. In order to increase or maintain a proper draught or circulation, a shaft or prolongation pipe, blower, or ventilator may be provided at F.

Trinitrotoluene Manufacture.

SOCIETÀ ITALIANA PRODOTTI ESPLODENTI and FERDINANDO QUARTIERI, of Milan.

No. 19,566; Sept. 6, 1914.

The patentees point out that, in the ordinary process of manufacturing trinitrotoluene, toluene is used as raw material, and by suitable nitrations it is made into mononitro-, then into dinitro- and last into trinitro-toluene; or, better, the mononitro- is transformed directly into trinitro, or also the toluene may be transformed with only one nitration to the dinitro- and then the latter to the trinitro-toluene. In all these various processes there is the drawback of an abundant formation of a liquid product which, if it is not conveniently separated, gives rise to an impure trinitrotoluene, which must be crystallized from alcohol or other solvents in order to obtain it at the degree of purity required for the preparation of exploding charges.

According to the present invention, the solid dinitrotoluene, obtained from toluene by any known process, is submitted to a partial and fractional liquefaction, whereby pure dinitrotoluene and a liquid containing impurities are obtained. The pure dinitrotoluene is heated gradually to 110° C., with addition of a nitric sulphuric mixture (having 20 to 30 per cent. of nitric acid) in the proportion up to about four to five times the weight of dinitrotoluene. By slowly cooling the mass thus obtained, abundant crystallization of pure trinitrotoluene takes place, which is washed with water and then melted into a vacuum to eliminate volatile impurities, such as the acids. A pure product is thus obtained which, after being granulated and dried, is said to have an extremely high degree of solidification—namely, about 80·5° C.—and has the same properties as that obtained by crystallization from volatile solvents.

The liquid containing impurities obtained during the purification of the raw dinitrotoluene is separated from the mass and nitrated separately to obtain solid dinitrotoluene, which, in its turn, serves as the starting material for the production of pure trinitrotoluene, as stated before.

Recovering Ammonia in the Form of Sulphate from Gases.

RIGBY, T., of Dumfries, and WETCARBONIZING LIMITED, of Dean Farrar Street, Westminster.

No. 18,559; Aug. 11, 1914.

This invention relates to the obtaining of ammonium sulphate free from discoloration in the gasification or the destructive distillation of combustible materials.

The patentees say they have found that discoloration of the sulphate—apparently due to the presence of small residual quantities of tar in the sulphate liquor—"can be readily overcome by utilizing in an improved manner the affinity which certain oils are known to possess for such impurities." According to their present invention, the oil is brought into contact with the sulphate liquor, from which it absorbs impurities; and it is then separated from the liquor, as, for example, by simple decantation.

In carrying out the invention in connection with the utilization of peat in gas-producers, the tar separated from the gases is subjected to distillation, and of the resulting lighter fractions some of the oil is added to the sulphate liquor as the latter passes to the evaporators. The oil and liquor are then thoroughly beaten together until they form an emulsion in which the two liquids are brought into intimate contact with one another, with the result that as the oil has an affinity for the tarry and like impurities in the sulphate liquor it absorbs these from the latter. Separation of the oil from the liquor is then effected in any known manner, as by simple settling and decantation, which is most easily carried out by permitting the mixture to flow into a container having an overflow which allows the oil (on account of its having a lower specific gravity than the liquor) to pass off and be thereafter wholly or in part returned to the gas-washers, where it serves to act as before upon a fresh quantity of sulphate liquor. Before being returned to the washers, however, it may be added to the material entering the tar-stills, in order to free the oil from the dissolved impurities; and after having been thus freed from the oil and impurities, the sulphate liquor is passed to the evaporators as usual.

Distillation of Wood.

PRITCHARD, T. W., of Wilmington, U.S.A.

No. 20,867; Oct. 12, 1914.

This invention relates to the destructive distillation of wood and other like substances, and has for its object to equalize the heat throughout the mass of material being treated, so that all the material treated will be brought to, and maintained at, the temperature desired for distilling off the more volatile substances present, or for driving off the products resulting from the destructive distillation, and so that all parts of the mass of material are heated up at a uniform rate, and thus prevent any one part of the mass from advancing in its distillation or decomposition faster than other parts. By attaining these objects, the time required for producing successive fractional distillates and for completing the destructive distillation is said to be reduced, and the yield of the more volatile and more valuable fractional distillates is increased.

For effecting the thorough heating of the charge, the gases and vapours generated during the heating are withdrawn from the lower part of the distillation chamber and reintroduced into the upper part, wherein means are provided for introducing into the chamber previous to the distillation a gas which is a non-supporter of combustion; the charge being kept stationary throughout the process.

It has been found, says the patentee, that where a retort has been filled with wood and heated even by the circulation of a heating medium, by means of which a more equable heat throughout the retort can be maintained than can be done by fire heat applied directly to the retort, the temperature at different points in the charge varies sometimes as much as 100° Fahr.; so that, in order that the products which are driven off at a particular temperature may be driven off

from all the wood or other matter which form the charge, it is necessary to maintain the heat for a long time at a very considerable expenditure of fuel, as, unless this is done, some part of the charge is not heated sufficiently to drive off the more volatile substances, with the result that these substances remaining in the part of the charge not brought to the proper heat are driven off with the less volatile, and usually less valuable, substances produced by the higher degree of heat subsequently applied as the treatment progressed towards the complete destructive distillation.

Destructive Distillation of Bituminous Coal.

BLYTHE, F. C., of Northwood, Middlesex.

No. 19,750; Sept. 14, 1914.

The patentee proposes to add to bituminous coal a proportion of heavy hydrocarbon oil—such as petroleum, kerosene shale oils, heavy tar oils, or heavy hydrocarbon oils—and then heat and distil the mixture under pressure, which "can be regulated so as to yield from the coal a large proportion of hydrocarbon oils and a small proportion of permanent gas."

In carrying out the process the hydrocarbon oil is mixed with the bituminous coal in a crushed, ground, or small state—a convenient proportion being about 5 or 10 parts of the hydrocarbon oil to 100 parts of the coal. The mixture is then heated gradually in a closed vessel or still (say) of iron, so that the pressure inside the still rises to about 60 lbs. to the square inch. The temperature in the still is gradually raised to about 350° C., and then upwards to about 500° C. (or between these points). A convenient form of still is said to be a cylinder or a tube with an agitator or with a worm or spiral agitator moving the mixture forward to the discharge end; but no illustration of the plant suggested is given.

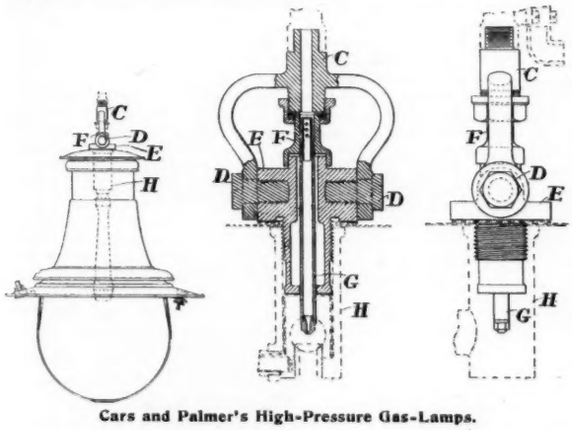
The volatile products which distil off under pressure are cooled and condensed as far as practicable; and any gas that does not condense may be used for burning. The presence of the hydrocarbon oil mixed with the bituminous coal is said to cause a more uniform heating, softening, or melting of the volatile constituents of the coal, and generally acts as a carrier of such constituents. Besides this, the pressure during the distillation prevents to a large extent the formation of permanent gas. The hydrocarbon oil so added to the coal will also distil over to a large extent and be recovered with the hydrocarbon oils from the coal.

High-Pressure Gas-Lamps.

CARS, B., of Highbury, and PALMER, W. D., of Muswell Hill, N.

No. 24,156; Dec. 16, 1914.

This invention relates to high-pressure inverted gas-lamps of the type in which the weight of the lamp is supported by trunnion bearings so that it may be swung at an angle to facilitate the removal of the nipple tube (for cleaning or otherwise).



Cars and Palmer's High-Pressure Gas-Lamps.

A side elevation of the lamp is given; also vertical sections of the upper part at right angles to each other.

The tube from which the lamp is suspended may be the tube of the distance lighter or other tubular support. The fitting C, screwed into the lower part of the tube, carries depending arms, the lower ends of which are spread out and are formed with plain holes through which are passed headed studs D, so that the lamp can swing, as on trunnions.

At the upper part of the enlargement E is a cylindrical flange having a plain periphery on which fits (as a cap), in a gas-tight manner, but with capability of sliding, a correspondingly formed enlarged lower end having a cylindrical interior, of a tubular connecting piece F, the upper end of which has a flange engaging by a union nut screwing up so as to make a gas-tight joint. A tube G is provided to carry the burner nipple, and near its upper end the nipple tube is fixed to the tubular connecting piece F by screwing into the lower end of it; the nipple tube passing loosely through the tubular fitting and at its lower end entering the air-box. The upper end of the tube G is provided with a perforated cap of smaller diameter than the base of the connecting piece F. By simply unscrewing the union nut and letting it fall on to the enlarged lower end of the connecting piece, the lamp may be swung out to the requisite angle, so that the operator has only to handle one small part of the lamp while clearing or changing the nipple.

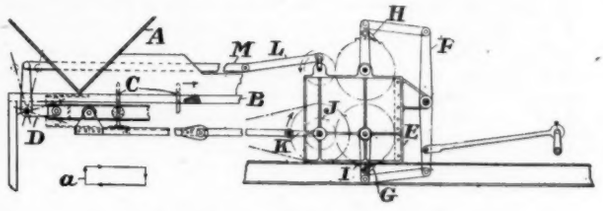
The patentees remark that, by the means described, the weight of the lamp is never borne by the operator; "he is merely required to momentarily use both hands to take out the nipple tube, which he can then manipulate to suit his own convenience."

Screening Coke.

ORDISH, F. W., and ROBERT DEMPSTER AND SONS, LIMITED, of Elland.

No. 1700; Feb. 3, 1915.

The object of this invention is to provide a fixed bar screen (horizontal or approximately horizontal) with conveying or propelling means which will act with a slow movement and without occupying excessive vertical space. For this purpose, fins or rakes are employed which work between the bars, preferably entering the screen from the underside—having either a vertical or horizontal stroke and return, or in some forms a combined vertical and horizontal movement with return clear of the screen, produced by a cam or eccentric.



Ordish and Dempster's Coke-Screening Plant.

The details of the mechanism whereby this invention can be put into practice are capable of numerous modifications; but the patentees show diagrams illustrating two forms of such mechanism.

In the one reproduced, A is a feeding hopper for delivering coke on to a fixed bar screen B, along the surface of which the coke is propelled by rakes C working between the bars. The rakes are carried on a reciprocating frame which runs on rollers upon a rising and falling track, which is raised and lowered by bell-crank level D. The rake frame is shown at the limit of its stroke towards the left-hand side of the parts represented, while the lever and track are shown in full line in their mid-positions. On a fixed framework E is pivoted a rocking lever F actuated by a crank, and driving alternately two pawls G H. The former drives a ratchet wheel I, on the shaft of which is a gear-wheel driving a pinion J, on the shaft of which is a crank K connected by a rod to the frame. The pawl H similarly actuates, through the crank and rods L M, the upper arm of the lever. The rakes thus receive a movement of rectangular character as represented in the diagram shown—the mechanism being then in the phase corresponding to the point A in the diagram; and their return stroke is accomplished while their tips are at a level below the surface of the screen.

APPLICATIONS FOR LETTERS PATENT.

13,709-10.—WOODVINE, G., "Laying pipes underground." Sept. 27.
13,716.—WOODVINE, G., "Pipe-coupling." Sept. 27.
13,756.—LENNOX, A. B., "Distilling tar." Sept. 28.
13,795.—GOULD, F. J., "Globe-holders." A communication from G. Ross. Sept. 28.
13,836.—KEITH, J. & G., "Gas-burners." Sept. 29.
13,850.—GRAHAM, J. T., "Production of gas." Sept. 29.
13,926.—HUTCHINSON, B. G., "Prepayment meters." Oct. 1.
13,988.—BENTLEY, J. E., "Gas-regulators." Oct. 2.

The New London Lighting Order.—It is officially stated that, as the result of the new lighting order, the private and shop lighting of the London area has been brought generally within the required limits. This, however, has had the effect of materially reducing the total illumination of the streets; and since the object to be attained by the reduction of lighting is not a near approach to complete darkness, but a uniform degree of subdued illumination throughout the area, it is believed that, in the process of equalization which is now proceeding, the public lighting of both the main and the side streets may be somewhat increased. Any changes in this direction must, however, be made only on the instructions given by the Commissioners of the Metropolitan and City Police on the advice of the Anti-Aircraft Department of the Admiralty. The Commissioner of Police has urged the local authorities to assist the traffic by whitening street refuges and kerbs at street corners; and this course has already been followed by several borough councils with excellent results.

Advantages of Co-Partnership.—In the course of an address at the Cripplegate Institute, in which he drew attention to the advantages of co-partnership, Mr. Horace Long, the Secretary of the Redhill Gas Company, said: "One of the most significant phases of the development of organized industry in the last quarter-of-a-century has been the conception and adoption of the principles of co-operation. Its object is that the worker shall be inspired and encouraged by the employer (his co-partner) to produce by means of his labour the greatest degree of satisfaction both for himself and his master in the furtherance of a common cause—*i.e.*, the success of the undertaking in which they are mutually engaged. The adoption of the principle may almost be said to obviate the necessity for the supervision of the worker, since the co-partner, possessing a tangible interest in the concern, can be safely relied upon to carry out his duties with attention and care, and to apply himself to his tasks as though performing them directly under the eyes of his employer. Out of the true spirit and practice of co-operation, is thus produced a sense of proprietorship which, in its turn, fosters in the mind of the worker a healthy self-respect and self-reliance (individuality), in comparison with which the mind of the more servile wage-earner is poor, weak, and barren, and without any hope and outlook."

MISCELLANEOUS NEWS.

EVIDENCE ON FACTORY LIGHTING.

The first report of the Home Office Departmental Committee on Lighting in Factories and Workshops, together with its appendices, has been dealt with at length in several of the last issued numbers of the "JOURNAL," and these references may now be supplemented by some notice of the evidence given by the 36 witnesses at the eleven sittings of the Committee (between March, 1913, and February, 1915), which was presided over by Dr. R. T. Glazebrook, F.R.S. The volume containing the minutes of evidence is well arranged, and extends to close upon 200 pages; the questions numbering nearly 4000. In addition to the verbatim report, there is a convenient *précis* of evidence; and the labours of those desiring to follow a single point right through the inquiry are much simplified by a section which very briefly notes the bearing of the statements made by every witness under each separate head.

Mr. *Gerald Bellhouse*, Superintending Inspector of Factories, whose division covers practically the whole of the cotton area, was the first witness. He said that he would like to see the Committee specify that there should be a definite amount of illumination in the neighbourhood of a certain class of work. Without a standard of adequacy, constant disputes must arise; and there was likely to be difficulty in producing evidence sufficient to establish an offence in a court of justice. An effort had been made to lay down a standard at a conference with iron-founders. A proposal was made for a certain ratio of window area to floor-space, and so many foot-candles for artificial lighting where the work was being carried on. A scheme of this kind should be workable, though there were, of course, great difficulties, because there were so many varieties of industry, and what might be sufficient in one case might not in another. Some agreement might have been come to, had not the present Committee been appointed. On the announcement of the Committee's appointment, however, the employers declined to further consider the matter, pending the issue of the report. It might be possible to classify certain processes according to the standard required; but he was not prepared to suggest what the standard should be. This could not be done until the Committee's investigation was complete. He had inquired into the question of bad lighting in relation to accidents in connection with foundries; and it was very difficult to prove that accidents were more numerous in a badly-lighted foundry. He did not feel he could say definitely that the accident rate was high in factories that were bad merely from the point of view of lighting. In a well-lighted cotton mill, for instance, employers got more and better work done. The standard of artificial lighting was improving rapidly in the mills. Incandescent gas was largely used in weaving sheds. Gas was useful in the direction of affecting the atmosphere. It made spinning and weaving better. It was not uncommon in Lancashire to have one light to every two looms; but in many cases there were not. There did not seem to be any definite rule. With regard to artificial lighting of foundries, the proposal that had been made was that 0·3 foot-candle at the point where the work was going on might be regarded as a fair standard. He certainly attached importance to whiteness in walls and ceilings. Most factories, of course, were compelled to limewash every year; but foundries were entitled to exemption.

Mr. *J. G. Clark*, of the Gas Light and Coke Company [who gave evidence along with Mr. *How*], stated that, so far as he knew, the lighting of factories and workshops had hitherto been arranged along lines suggested by experience; and in some cases experiments had been made and trial installations put up. Having regard to the variety of things that went to make good lighting, this method had much to be said for it. In the practical illumination of worshops, conditions were often met with which imposed limitations in the design of the installations. The term adequate lighting, of course, had a wide meaning; but in the case of a new works coming into their hands, they would see that the lighting was satisfactory. He knew of one fitting shop provided with cutting tools, where the illumination in some places was as high as 35 foot-candles; and though this would, of course, be regarded as high, the men were working in great comfort. The lights were well shaded; and there was no uncomfortable glare effect. On the other hand, he had noticed illumination as low as 5 foot-candles with the same kind of work, on cutting tools; and apparently the people had been quite satisfied with it. Of course, the 35 foot-candles was confined to quite a limited space, just where the man was. Mr. F. W. Goodenough in a paper read before the Illuminating Engineering Society in March, 1912,* dealt with printing works lighted by gas; and a case was quoted in which there was an illumination varying from (say) 10 to 12 foot-candles, covering an area of about one-third of the total area illuminated. This was speaking of a composing frame. The other two-thirds were illuminated with from 10 to about 3½ foot-candles. Witness had had no experience of indirect lighting in the case of factories; but, taking illumination as a basis, he should estimate the cost would be something like two to one in round numbers. That was to say, indirect lighting would require twice the expenditure of energy needed for direct lighting, assuming equally efficient sources were used in each case. He should doubt whether increased comfort to the eye, using the indirect system, would to a certain extent increase its sensitiveness, and thus counterbalance the loss of light. Asked what was his idea of minimum general illumination, Mr. Clark said he should feel inclined to put it at something like 2 to 3 foot-candles—preferably 3 for general illumination in workshops. This should be supplemented by local illumination where necessary for the work. Passages, of course, differed; but for an ordinary gangway he would say 1½ foot-candles would be sufficient. Staircases should have a little more—say, from 2 to 3 foot-candles. For lighting in factories, &c., there should be a maximum fixed, as well as a minimum; but the range should not be narrowed too greatly. Though much could be said about glare from an economic standpoint, and also in regard to comfort, he had no knowledge of any harmful diseases arising from the use of unshaded and imperfectly shaded lights. In fact, he had often been struck with the scarcity of spectacles when the lighting would seem to conduce to bad eyesight. But he would strongly urge that the proper use of shades should form a part of any measure that had for its object the reform of lighting. He did not see that any very serious difficulty would be found in designing lighting installations to give an illumination within specified limits.

Mr. *H. C. Wheat*, Illuminating Engineer to the British Thomson-Houston Company, next gave evidence with regard to electric lighting. He said he would like to suggest that metallic filament lamps as ordinarily employed were defective in so far that they showed a great deal of glare. They were often, therefore, a source of danger, because, apart from the general lowering of the visual acuity due to the visible light, the glare had a blinding effect liable to produce accidents by causing operatives to come into contact with the machinery, and other obstructions. The amount of glare could be specified by defining a minimum horizontal distance from which the lamp itself should be visible as compared to its height above the floor. That was to say, a shade should really hood the lamp. Asked what proportion of factories would use indirect lighting, he replied that, according to his firm's experience, the proportion was a very small fraction of the whole, because it was only under quite special conditions that they had as yet used indirect lighting for factory work. He thought it would be possible for the Committee to lay down some definite rules as to the minimum intensities of illumination for different classes of work. Other things which might be specified were the matter of glare or the visibility of the lamps, and possibly sometimes the style of lighting. They did not find that workmen complained of too much light; but they did complain of glare from reflections from the polished parts of machines, and this was why very small lamps were advocated. Witness submitted to the Committee, and explained at length, typical lighting specifications for the different shops in an engineering works, and stated the intensities of illumination which he recommended for the various classes of work.

Mr. *W. Williams*, Superintending Inspector of Factories for the Northern Division, expressed the opinion that in large industries the attention paid to lighting was certainly increasing. In both old and new works, artificial lighting had enormously improved since the advent of the incandescent gas-mantle and cheap electric lighting. In many classes of work, bad lighting did add considerably to the risk of accidents; but it was very difficult to prove this by statistics. He had heard of a case in which one large foundry actually discarded big units of light because it was found that they caused a man to step over a shadow, thinking it was a pit, and to actually walk into the casting. When working in these places, one almost instinctively stepped over a shadow, if it was very deep. He could not see that it would be easy to introduce any definite standard of lighting. What he would very much like to see would be a general requirement such as there was for heating—for example, that the light should be adequate and free from glare. This would leave every case to be settled on its merits, more or less. The heating regulation did not specify a given temperature; it had to be reasonable. Under this section, very great work had been done in getting proper heating. Speaking from an inspector's point of view, he would far rather see a standard adopted for lighting; but it seemed to him that any standard which might be suggested would perhaps have to be lower than one would like to see generally adopted. If general recommendations as to merely adequate lighting were made, the Department would work out some sort of scale for themselves, for the instruction of inspectors; and perhaps after some years of working it would be practicable to fix standards. He would not like to say it was not even now practicable. Asked whether he had any choice of the kind of artificial light to be used, witness replied that he had not, though before the advent of the incandescent system he had a very strong idea against gas lighting. One found the atmosphere got extremely bad with the ordinary gas-burner. He had seen very efficient lighting by the high-pressure gas and oil-gas systems, and by electric arc lights. Some figures as to the variation of light found in different factories were given in a paper read by Mr. A. M'I. Cleland, of Belfast, at a meeting of the Irish Association of Gas Managers in Dublin in 1912*. In a laundry, for example, the minimum illumination at the working-level was 5 foot-candles, and varied from that to about 7½ foot-candles. At a tinsmith's, the variation was from nearly 9 to 12½ foot-candles; and at a fancy-box maker's from 4 to 11¾ foot-candles. Witness's experience was that the various branches of the jewellery trade required a very good light; but the application of artificial light was varied to suit the different branches. Working jewellers commonly worked with an incandescent gas-lamp about 2 feet from their work; but by means of a lens or globe of water they concentrated the light rays on their work. Engravers worked with a low naked gas-flame shaded by means of tissue paper placed between the flame and their work. The work of a watchmaker could be well lighted by an incandescent electric lamp quite close to the watch, and completely shaded from the worker. He had met a watchmaker who said he had had to stop work for about eighteen months owing to the effect of using an ordinary flat-flame burner just in front of his eyes. The incandescent electric lamp was one of the few lights which could be completely shaded and placed near one's face. Any dangerous tool like a saw or a machine-planer could not have too good a light. Roughly there were 2000 accidents from circular saws reported to the Department every year, so that one could not be too careful in dealing with them. Among other things, high illumination was required for artistic work of any sort, and in the examination of finished products, which was frequently very trying to the eye. In a Londonderry stitching factory, where ordinary incandescent electric lights had been replaced by mercury vapour lamps, the women said the new light was softer on their eyes, that the eye-strain was imperceptible, and that headaches were less prevalent than formerly.

Miss *R. E. Squire*, Deputy Principal Lady Inspector of Factories,

* See "JOURNAL," Vol. CXVII., p. 872.

* See "JOURNAL," Vol. CXIX., p. 183.

dealt with cases of insufficient and unsuitable lighting, and stated that tiring effect of electric light on the eyes was a very frequent source of complaint. There were, however, fewer complaints now than was the case when incandescent electric lamps were first used for workrooms. She also referred to a complaint of gas giving a bad light and hurting the eyes of a machinist in a boot factory, where incandescent mantles were said to be impracticable for the sewing machines. It ought, witness thought, to be possible to fix some standard for lighting. In cases of dispute, evidence might be produced before the magistrates from the workers as to the interference with the work and the suffering to their eyes; and one could apply the ordinary rough test as to whether small or medium print could be read in a given place at a given time. The use should be forbidden of places where there was no possibility of working by anything but artificial light. In the Netherlands no woman or girl was allowed to be employed in artificial light between the hours of 9 a.m. and 3 p.m. Of recent times the number of basement rooms had largely increased; and it would be a serious thing to try and enforce such a law as the Netherlands one. There should therefore be an enactment that no room should be built after a certain date which did not meet stated requirements as to lighting. Any part of premises under the Factory Act to which workers had access in working hours ought to be lighted, whether it was technically a factory or a workshop or not. The Truck Act allowed a deduction to be made or payment to be received from the workpeople, for lighting in a factory; and this charge was found in a great many places, chiefly in the Midlands. A charge for gas was almost universally made upon the workpeople; and this, of course, was a survival of the old plan of each worker bringing his own "dip" or candle to work by. But the system had operated to delay the installation of suitable lighting. The employer's charge had generally been made on lines generous to himself; and therefore old gas-burners had been allowed to continue, wasting a large amount of gas. There has been no alteration in most of these places, even when better methods of lighting had been installed in the surrounding premises, because the employer had had no incentive to reduce his charge by an improved system. This provision of the Truck Act should be abolished. It had frequently been found where electric light was to be had in the town, and had been applied even to an employer's own warehouses and offices, the workrooms continued to have the old system of gas-burners, because the workers were still paying for it. The employer knew that if he made any change, the workers would object to having a fresh arrangement, the matter would be discussed, and an altered contract for charges for lighting and the whole question generally would be raised, so that in the end the charge would be abolished, and the whole cost would then fall on the employer. In fact, this consideration was carried so far that just a short time ago witness came across a case in some works where the employees were still bringing their oil-lamps to light the place, though there was electric light in the town.

The witnesses so far dealt with occupied the attention of the Committee during their first two sittings.

OLDBURY GAS ACCOUNTS.

At the last meeting of the Oldbury Urban District Council, under the presidency of Mr. J. W. D. Pratt, the statement of accounts of the gas undertaking for the year ended March 31, prepared by the Gas Engineer (Mr. C. H. Carder), was submitted to the members, and eventually adopted.

Mr. E. W. Jackson (the Chairman of the Gas Committee), in moving the adoption of the accounts, explained that the coal gas made during the year was 148,588,000 cubic feet, or 12,098 feet per ton. The oil gas made was 23,624,000 cubic feet, or 13·72 per cent., showing a total make of 172,212,000 feet. The gas sent out from the works was 172,041,000 cubic feet, an increase over last year of 6,652,000 feet, or 4 02 per cent. The unaccounted-for gas was 10,014,600 cubic feet, or 5·82 per cent. The amount given in aid of the rates by reduced charges for public lighting was calculated at £772 for the year. During the past twelve months the loan account of the undertaking had been increased by £6200, for the construction of a new holder, making the total loan capital authorized £85,399. The loan indebtedness on March 31 was £53,470. In connection with the revenue account as compared with last year, coal, oil, &c., cost more by £913. The total cost of manufacturing gas was more by £2217; while the distribution charges for the year were less by £380. The total expenditure for the year was more by £2257. The revenue from sales of gas increased by £1265; and that from residuals was less by £565. The total revenue for the year was up by £544; but the gross profit decreased by £1713, and there was a net loss of £1549.

Mr. H. H. Robbins remarked that the gas sold for motive power was 50,489,300 cubic feet, or one-third of the total consumption; and yet the profit on this quantity was only £210. They could see the position of the gas-works that day; and he maintained that they would be in the same position at the end of next year, if there was nothing done with regard to the price of gas for motive power, which ought, in his opinion, to be increased. They were spending £2000 at present on a water-gas plant, absolutely for the benefit of motive power users, to whom they were selling at a profit of only 1d. per 1000 cubic feet. If they had only the ordinary consumers to cater for, there would, he urged, be no necessity to go to the expense of erecting a new holder at a cost of £6200. The Gas Committee never had a better chance than they had now of increasing the price for motive power purposes. As most of the local works were busy on war supplies, he did not anticipate any difficulty in getting an advance. There had been a reduction in the quantity of gas sent out for the past month of 529,000 cubic feet; and there would be a further decrease next year, because they had lost the Rowley contract, under which 7,000,000 cubic feet of gas per annum was taken. It was, he considered, time something was done to make the undertaking pay. It had been a "bugbear" to the town since it was started; and it was going to be a serious matter for them unless

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something was done to put the concern on a proper business footing by charging more for motive power gas.

Mr. DAVIES asked if the charges for motive power were based on the old list of 1s. 8d. per 1000 cubic feet, or upon the new one of 2s. 4d.

Mr. JACKSON said the charges were made upon the old list, as the price had only recently been raised.

Mr. DAVIES: So we can look forward to £1000 increased revenue from this source next year.

Mr. ROBBINS: But you have got a 6d. increase on the coal; and whatever happens there is only 1d. per 1000 feet profit on the motive power gas.

Mr. WALLACE said there was a loss on the year's working of about £2000, which would have to be made up from the reserve fund. Some time ago their reserve fund stood at £10,000; but it was now only £3000. They ought to pay attention to this matter.

Mr. JACKSON said if they put against the loss on the year the sum of nearly £800 allowance in respect of public lighting, and £800 paid out of revenue in regard to the new holder, the position was pretty nearly brought level.

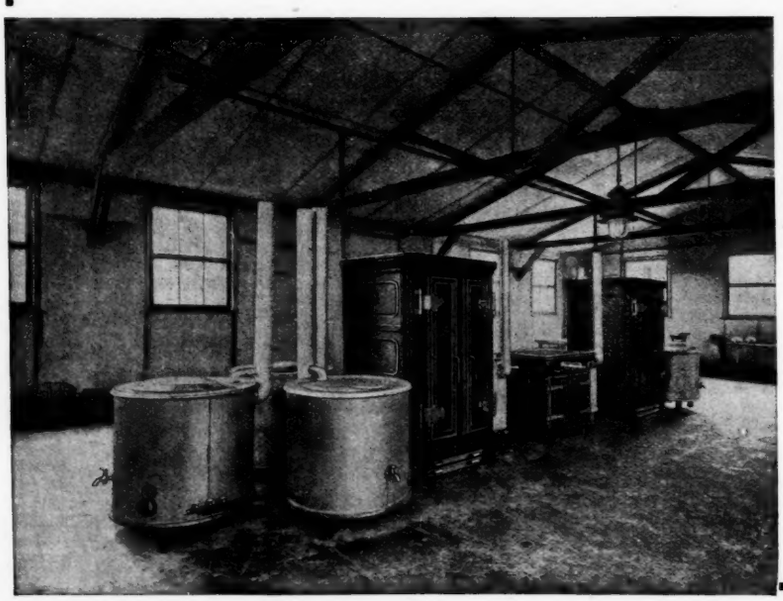
Ultimately the accounts were adopted.

SUCCESS OF NEW WORKS AT BRIDGWATER.

A slight decrease in the sale of gas for the year ended June 30—chiefly attributable directly and indirectly to the restrictions imposed on both public and shop lighting during the early months of this year—was reported by the Directors of the Bridgwater Gas Company at the recent annual meeting. In order to secure adequate supplies of coal, a very serious advance in the contract prices for the current year has had to be paid; and to meet this additional charge and the increased cost of all other materials, the Directors have found it necessary to advance the price of gas 6d. per 1000 cubic feet. Of the staff and workmen, 35 per cent. have joined His Majesty's forces since the outbreak of war. The Directors thought it right to make allowances to their dependants. An opportunity having presented itself to acquire commodious property on lease in the centre of the town, the Board decided to acquire it, and to remove their present offices and show-rooms. The balance of the net profit for the year was £3464, which, added to the amount brought forward, and bank interest, made a total of £4369. Interim dividends and debenture interest had been paid, and there remained a balance of £2283 to be dealt with. The Directors recommended the payment of final dividends for the year of 5 per cent. on the "A" stock (making 10 per cent. for the year), 2½ per cent. on the "B" stock (5 per cent. for the year), and 2½ per cent. on the "C" stock (5 per cent. for the year). This would absorb £1775, and leave a balance of £508 to be carried forward. The Chairman (Mr. R. Y. Foley) said he was sure the proprietors would agree that the accounts were of a most satisfactory character. The new works lately erected continued to give unqualified satisfaction; and the results had exceeded their expectations—the make of gas per ton of coal and oil equivalent having increased from 9500 to 11,675 cubic feet. This success had reflected itself in the employees' bonus, which last year amounted to the very handsome sum of 9 per cent. on their wages, in addition to which all the workpeople had been given a war bonus of 1s. per week on their wages. The erection of the new retort-house, though only in substitution for an older building, had been eagerly seized upon by the authorities as an excuse to raise the assessment of the works from £1100 to £1400, which on appeal had been reduced to £1325. This additional taxation, combined with an increased cost in almost every other direction, added to the working expenses. On the top of this came a 6s. per ton advance in the price of coal, representing something like £2250 a year to the Company, necessitating an advance in the price of gas. It was not likely much relief would be secured by the Coal Prices (Limitation) Act. In the early months of the year, the streets were, by official orders, suddenly plunged into gloom, through fear that their brilliant illumination might attract the undesirable attentions of passing Zeppelins. This diminution of public and shop lighting had a considerable effect on the sale of gas. The restrictions so hastily imposed were, however, as hurriedly withdrawn—it was believed by a hint from headquarters that in localities where it was reasonably safe to do so the consumption of gas should be encouraged, so as to augment as much as possible the production of toluol. If there was any truth in the rumour that, in pursuit of economy, the local authorities intended to put out every second street-lamp during the coming winter, any such step would lessen the Company's production of toluol. Every encouragement should be given to the production of gas, thus increasing the quantity of high explosive material so much needed. In connection with the manufacture of toluol, the Government expert who frequently visited their works described the results as excellent. From every ton of coal carbonized sufficient toluol was being extracted for 3½ 3-inch high explosive shells; so that something like 26,300 shells might be taken as being supplied with high explosive from their works in a year. The Chairman congratulated Mr. J. H. Cornish (the Manager and Secretary) on the results he had achieved; remarking that in his work he had been loyally assisted by his son and the other members of the staff.

Salford Corporation and Sale of Sulphate of Ammonia.—The Gas Committee of the Salford Corporation are reported to have accepted an offer of Messrs. Brunner, Mond, and Co., Limited, of Northwich, to purchase the sulphate of ammonia produced at the gas-works for so long a period as they require it for the manufacture of materials on behalf of the Government, at the average price of sulphate of ammonia, in single bags, f.o.b Liverpool, as certified by Messrs. Bradbury and Hirsch, after deducting 2½ per cent., with an allowance off such price of 8s per ton—subject to the price for each month's deliveries being based on the average price for that particular month.

CONVALESCENT CAMP, EASTBOURNE, fitted throughout with Arden Hill's Gas Apparatus.



Interior of one of the five cook-houses, each of which is fitted throughout with

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WINDSOR WATER SUPPLY.

A New Filter Installation.

A system of bacterial purification has just been adopted to ensure the purity of the water supply to the borough of Windsor, as also to Eton—including the College, and the troops in the district. The installation was formally put into operation in the presence of the Mayor and Corporation—with the Borough Surveyor and Water-Works Engineer (Mr. E. A. Stickland) and the Medical Officer of Health.

Prior to the opening ceremony, the Mayor (Mr. Councillor W. Carter) entertained the assembled company at luncheon; and in the course of his speech referred to the courtesy of the Reading Corporation in permitting the Windsor Corporation to investigate the Candy filtration system (which they had adopted) as used by the town with such success. The Chairman of the Reading Water-Works Committee (Mr. Alderman T. B. Parfitt), in an interesting speech, described the Reading Water Supply (which is taken from the navigable River Kennet) and set forth the reasons that led them to adopt the "Declor" filters for his town.

The installation at Windsor consists of six of these pressure filters—each 8 ft. 3 in. internal diameter by 18 feet high—constructed of mild steel plates to withstand a working pressure of 100 lbs. to the square inch. The water supply for Windsor is obtained from wells on Tangier Island—the water being pumped by hydraulic or electric power, as the case may be, into the mains. The water, however, does not now go direct into the mains from the pumps, but is diverted, so that it first passes through the filters. A low-pressure turbine placed in the 12-inch pipe leading to the filters is so constructed that its speed of rotation is proportionate to the volume of water passing at any given time. A small ram-pump (provided in duplicate) is worked from a countershaft driven by the turbine; and this pump is continually injecting into the water passing to the filters, a solution of calcium hypochlorite, so that the water receives its correct dose of free chlorine. The solution of calcium hypochlorite is contained in a small tank, and the ram-pump draws direct from the solution tank, which is also in duplicate.

After its chlorination the water flows along the filter mains, and subdivided by branches passes equally into the filters, each of which is arranged for dealing with up to a maximum of 8000 gallons per hour; so that the installation is capable of coping with well over a million gallons per 24 hours. The treated water enters the filters at the top, and, after passing slowly down through them, flows through branch pipes from the bottom into a branch main, and thence to the town. The upper part of each filter contains a bed of silica sand and gravel, which serves as a protecting layer to the dechlorinating bed placed in the lower part. In addition to containing the silica bed, the upper and middle part of each filter is arranged to act as a contact tank; so that the free chlorine remains in contact with the water for half an hour—from the time of entering the filter to the time the chlorine is eliminated. This elimination takes place in the dechlorinating bed in the lower portion of the filter. The active dechlorinating agent is a special granular insoluble carbonaceous material which rests upon graded layers of silica, supported, like the silica sand bed, on a perforated floor.

The filter contains sufficient of the dechlorinating material to last for a year's working; and, when fresh material is required, the old can be readily removed (through manholes provided for the purpose), and fresh material put in its place—an operation that can be performed in a few hours.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The accounts of the Gas Department for the year ended June 30 and the estimates for the current year were considered at the last meeting of the Greenock Corporation. Much satisfaction was expressed at the successful results of the past year—ending, as it did, with a net surplus of £1582—and it was agreed to give the Engineer and Manager (Mr. James Macleod) an honorarium of £50, as an appreciation of his working of the department. The estimates were adopted; and the price of gas was increased 5d. per 1000 cubic feet to consumers by ordinary meters and 4d. to consumers by slot-meters, making the charge 2s. 11d. to ordinary consumers and 3s. 4d. to slot consumers. Rebates of 10 per cent. on accounts of £100 and over and of 20 per cent. in special cases were unaltered. Some figures from the report are as follows: Gas sold and accounted for 1910, 300 millions; 1911, 316 millions; 1912, 360 millions; 1913, 383 millions; 1914, 404 millions; 1915, 426 millions. An increase of 22 million cubic feet for the past year over the previous year is shown. The number of gas appliances out on loan during the past year was 11,053; being an increase of 1221 over the previous year. The number of consumers still increases, though last year shows the smallest increase for half-a-dozen years back. In 1909, there were 14,052 consumers; and at 1915 the total was 16,555—an increase of 2503 over this period. The amount of coal carbonized last year was 43,018 tons; the make per ton being 10,232 cubic feet, and the gas sold and accounted for 9903 feet—an increase of close on 400 feet over the previous year. The unaccounted-for gas was 3·21 per cent., as against 3·45 per cent. the previous year. The new plant is now complete, with the exception of the gasholder, which is not expected to be ready until the spring of next year. The whole of the gas required is being made in the Woodall-Duckham vertical retorts.

At a meeting of the Annual Committee of the Convention of Royal Burghs, held in Edinburgh last Wednesday, the Agent read the reply from the Scottish Office as to the resolution of the Committee suggesting the suspension of the sinking funds and the depreciation fund pro-

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visions of the Burgh Gas Supply (Scotland) Act, 1876. The Chairman (Ex-Provost Keith) said that the Scottish Office not only deprecated the suspension of sinking funds, but also any modification of the statutory obligations as regarded the depreciation fund. Mr. Alexander Morrison (Bridge of Allan) moved to the effect that: "The Convention, on reconsideration, express its agreement with the views of the Secretary for Scotland as to the desirability of gas authorities complying fully with the provisions of section 41 of the Burghs Gas Supply (Scotland) Act, 1876, so far as relating to the depreciation fund obligations of gas undertakings. But, while cordially concurring with the Secretary for Scotland that, as a general principle, all statutory obligations in relation to sinking funds and depreciation funds should be fully met as they arise, agrees that, in the public interest, the sinking fund provisions of the Burghs Gas Supply (Scotland) Act, 1876, and the corresponding provisions of other Acts of Parliament under which gas undertakings are administered, should be suspended for the duration of the war, and until the first term of Whitsunday occurring not earlier than one year after the close of the war, and resolves to press this view on the Secretary for Scotland with the object of getting him to initiate legislation on the subject." The Assessor for Stirling seconded. On a vote, however, the previous question was carried by a large majority.

Gas engineers in Scotland are following with great interest a development of the gas industry which has taken place at Akkrum, in Friesland, where peat mixed with coal is being used for the manufacture of gas of a very high quality. It was found that the retorts became too hot with peat alone, because of the great amount of steam generated. The proportions used are two parts of coal to one of peat; but it is possible that further experience may lead to the reduction of the quantity of coal at present necessary. Peat is plentiful in Scotland.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 11.

The value of pitch remains unaltered at the figure last recorded. Export business is most difficult to arrange, although buyers seem inclined now to take a more reasonable view of the situation. Creosote is firm at 4½d. per gallon, net, in bulk. Solvent naphtha continues in good demand; the value being 2s. 1d. per gallon, in bulk, at makers' works.

Sulphate of ammonia is firm at £14 8s. 9d. per ton, net and naked, at makers' works, for 25 per cent. quality.

Tar Products in the Provinces.

Oct. 11.

Markets for tar products remain fairly steady. There is very little business doing in pitch, and makers are more reasonable in their idea of value. The article has been offered at 20s. per ton f.o.b. without finding buyers. Creosote is still quiet, and is difficult to sell. Solvent and heavy naphthas are in good demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 20s. to 24s. Pitch, East Coast, 20s. to 21s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 19s. to 20s. Manchester; 20s. to 21s. Liverpool; 20s. to 21s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 1s. 11d. to 2s. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅝d. to 3d. Heavy oils, in bulk, 3⅜d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 5d. to 3s. 6d. Naphthalene, £18 to £25; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Oct.* 9.

Throughout the week there has continued to be a good demand for this material, and all parcels offered for sale have been readily absorbed at advancing prices, although the purchasing has again been mainly confined to dealers. Closing quotations are £14 15s. per ton f.o.b. Hull, £14 17s. 6d. f.o.b. Liverpool, and £15 f.o.b. Leith, for early delivery. There has been more inquiry in the forward position; but the views of makers have largely stood in the way of business. It has transpired, however, that several transactions have taken place at £15 2s. 6d. per ton at the ports for October-March delivery.

Nitrate of Soda.

This market has remained very firm at 13s. 6d. per cwt. for ordinary, and 14s. 6d. for refined quality, on spot.

Sulphate of Ammonia.

From another source it is stated that the market for this article has remained fairly steady throughout the past week, and at some ports the prices paid are an improvement. Outside London, makes are quoted at £14; Hull, £14 7s. 6d. to £14 10s.; Liverpool, £14 10s. to £14 12s. 6d.; Leith, £14 15s.; Middlesbrough, £14 10s. to £14 12s. 6d.

Public Lighting Charges at Doncaster.—The following practical recommendations have been made by the Doncaster Lighting Committee, as a result of considering the method of charging for public lighting under existing abnormal circumstances: (*a*) Where lamps are left unlighted, a charge of 10 per cent. on the capital value of same to be made to cover interest and standing charges; and (*b*) where lamps are partly used, the fixed charge to be made, less the estimated cost of gas and material saved, but *plus* 5 per cent. on the value of the lamp.

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COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is rather more active; and the output for the rest of this month seems to be well booked-up, both of steam and gas coals, while the prices are steadier. In the steam coal trade, there is a brisk inquiry; and for best Northumbrians from 18s. 6d. to 19s. per ton f.o.b. are current rates. Second-class steams are firm at 16s. 6d. to 17s. per ton; and steam smalls are little altered at 11s. to 14s. per ton f.o.b., according to quality. The output is fair, when the lessened number of miners at work in the collieries is borne in mind, and it is met by a good export need. The shipments of coal, home and foreign, from the local ports—the Tyne and to West Hartlepool—have averaged over the last month some 66,000 tons per working day for all kinds of coal. In the gas coal trade the demand is brisk; and as it is likely to improve for the rest of the year, the tendency of prices is stiffer. Best Durham gas coals are 19s. to 19s. 6d. per ton f.o.b.; second-class gas coals are 16s. 6d. to 17s. per ton; and "Wear Specials" are firm at 20s. to 21s. There is some variation in forward prices for gas coal; but the contracts for the Paris Gas-Works are now believed to be arranged for the whole of next year, for some 300,000 tons of Durham gas coals, at prices that are from 17s. to 19s. per ton f.o.b., according to quality. Freight for gas coals is at present shown by figures at 9s Tyne to London, and 17s. to 17s. 6d. Tyne to Rouen. There is a good inquiry for coke; but shipments are not so easy to arrange to some Continental ports that are good customers usually. Gas coke is steady, though the production is increasing—good makes being 28s. to 30s. per ton f.o.b. the Tyne.

It was announced on the Newcastle Commercial Exchange last week that the Paris Gas-Works had confirmed the order for the purchase of just over 250,000 tons of Durham gas coals for delivery next year, at 19s. per ton f.o.b. for "Wear Specials," and 17s. and 17s. 6d. for best seconds.

Coke for Cooking.—In a lecture on "Economy in Cooking," delivered at the Institute of Hygiene last Friday, Mr. Herman Senn, G.C.A., said there had never been a time when the art of cooking was more important than now. Economy in cooking comprised two things—the knowledge of food values and the power to substitute a less costly food for the more expensive (always with a due regard to obtaining a properly balanced nourishing meal), and the economy of fuel. As a nation, we had much to learn concerning the principles of applying fuel. Professor Bone had declared that one of the greatest and most urgent problems after the war would be that of fuel economy. Economy of fuel depended upon two qualities—intelligence and an infinite capacity for taking pains. The thing to aim at was slow deliberate cooking. More use should be made of coke and charcoal, which were admirable fuels for slow cooking.

Commercial Motors and the Petrol-Tax.

The Commissioner of Customs has informed a deputation of the Commercial Motor Users' Association that Mr. M'Kenna has introduced into the Finance Bill a clause to secure a 50 per cent. rebate of the new petrol-tax to all commercial motor users who have previously been exempt to the extent of 1½d. a gallon when the full tax was 3d. a gallon.

Technical Instruction in the Gas Industry.

At to-day's meeting of the London County Council, the Education Committee will report as follows: "The Board of Education have forwarded to the Council a report on technical instruction relating to the gas industry in the London area, which deals with the extent to which use is made of the existing provision for technical instruction in the subject, and with the efficiency of the instruction given at certain institutions, and makes suggestions for the training of gas-fitters' apprentices and students of gas engineering and manufacture The report does not call for any special action on the part of the Council at the present time, except in regard to the directions in which future developments should take place. We understand that there is always a dearth of competent gas-fitters; and any schemes of technical training likely to improve the general efficiency are, therefore, most desirable. A conference has been held between the Council's officers and representatives of the Institution of Gas Engineers; and we have had before us the views of the Advisory Committees and governing bodies of various Institutions interested in the matter. Detailed proposals for classes in gas-fitting for both junior and senior students will be considered in connection with the arrangements for session 1915-16."

An Unlighted Town.—Athy (co. Kildare) is to be without its usual public gas lighting this season, owing to the action of the Urban Council, who have now decided that it is "better to economize," in view of the fact that the Gas Company have raised the price from 5s. to 5s. 5d. per 1000 cubic feet on account of the increased cost of coal. A proposal that the lamps should be lighted on a division of the extra 5d., was not seconded.

Tees Benzol Syndicate.—The Tees Benzol Syndicate, Limited, has been registered, with a nominal capital of £100 in £1 shares, to manage certain works on behalf of His Majesty's Minister of Munitions, to carry on the business of colliery proprietors, steel makers, manufacturers of chemicals and bye-products produced from coal, &c., and to adopt an agreement with the Minister of Munitions. The Company is a private one; and the first Directors are Sir Hugh Bell, A. J. Dormans, A. F. Pease, J. H. Pease, W. L. Johnson, and G. B. Nancarrow. It is stipulated that no person other than the original subscribers shall be registered as a member of the Company who shall not have been previously approved in writing by the Minister of Munitions or his deputy.

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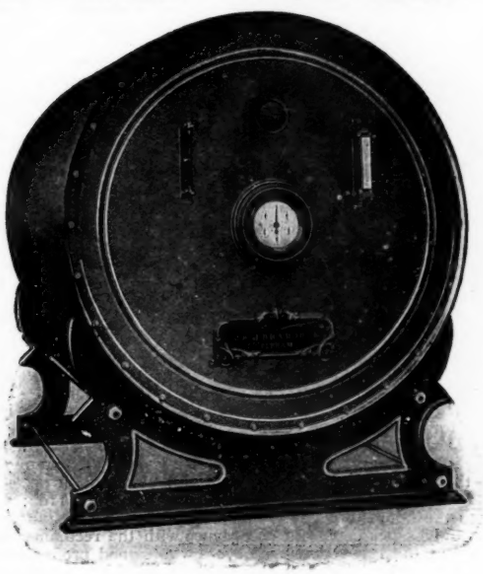

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Price of Gas at Wilton.—At last week's meeting of the Wilton Town Council the Gas Committee reported that the price of gas had been increased by 6d. per 1000 cubic feet, and that users of slot-meters would in future be charged 1s. a quarter for the use of the meter, in order to equalize the charges.

Street Lighting Complaint at Bradford.—The Bradford Technical Education Sub-Committee have decided by resolution to inform the Chief Constable that they consider the present street lighting unsatisfactory, and to request that arrangements should be made for improved lighting where necessary. The dark streets, they point out, have a serious effect upon attendance both at evening schools and classes, and consequently—owing to loss of grant from the Board of Education—upon the Committee's finances.

Lighting of Carrickmacross.—A new Company has been formed for public and private lighting in Carrickmacross (co. Monaghan). The capital is to be £6000; and the local gas-works and an electrical installation are taken over. The gas-works, mains, &c., are valued at close on £4000; and the plant is in great part new, having been renewed during the past three years. The general management will be under Mr. William Steele, Consulting Gas Engineer. The revenue of the old Company for some years past is stated to have been £800 per annum.

Gas-Works and the Labour Supply.—Owing to the large number of men who have joined the Colours, the high rates of wages paid to workers by manufacturers of munitions, and abnormal demands for gas by factories turning out warlike commodities, Sir Hallewell Rogers (the Chairman of the Gas Department), stated last week that, while there is no need for alarm, it is most desirable that economy in the use of gas should be exercised by the citizens of Birmingham. The output of gas, chiefly for munitions work, has increased by leaps and bounds, beating all previous records. The percentage of increase is over three times as large as for the corresponding period of last year; and the summer output was nearly equal to the previous winter output. In consequence of the reduced staff, it will be quite impossible to fix gas fires and cookers at the ordinary rate. The Gas Committee communicated with all the other departments of the Corporation, asking them not to dismiss workmen of whose services they are not in need without communicating with them. The Gas Department are anxious that all suitable men should be transferred to the gas-works.

The Best Form of Heating.—In the course of his lecture at the Institute of Hygiene last Wednesday, in connection with the exhibition and conference on lighting, heating, and cooking, Dr. R. King Brown, taking for his subject "Heating and Health," said that in choosing a form of artificial heating, it was wise to follow Nature as much as possible. Thus, the most healthy form of heating was by radiation combined with light, in imitation of the sun; and the best form of such heating was the much-abused open fire, albeit combined with the most modern improvements. It was often complained that a fire only warmed one side of one, while freezing the other. In this it was like the sun, and promoted movement which, with the consequent change of temperature, was natural and healthy. The great evil of the open fire was the amount of smoke belched into the atmosphere, which was the whole cause of the London fogs. The person who could invent a stove which would consume its own smoke would have conferred a great boon on humanity. The form most nearly approaching the ideal of natural heating was the improved fire, coke or gas, combining radiant heat and light with proper ventilation.

Halifax War Savings Committee.—Reporting to the Halifax Town Council on the question of war savings, Alderman Whitley Thomson pointed out that some months ago the Gas Committee withdrew a proposal for a capital expenditure of £50,000 for re-organizing the gas-works. Originally the Corporation had borrowing powers for various works amounting to £172,000; but at the request of the Treasury, this had been cut down to the extent of £47,000. Therefore, practically £100,000 of capital expenditure had been postponed. In regard to revenue, the war bonus to employees would come to about £4200 per annum, and the allowances made to employees serving with His Majesty's forces to nearly £10,000 a year. But for the war, he did not think there was any doubt there would have been a very good prospect of a considerable reduction of the rates next year; but owing to the war and the tightness of money, he could not hold out the slightest hope of any reduction. He was only afraid there might be an increase. The War Savings Committee appointed by the Council a month ago had arranged for a saving amounting to £6580 on the estimates for the current year. Nothing could have been more satisfactory than the action of the Committees in this matter. Other economies were suggested, and would be considered. He was assured that practically no reduction of labour would result from these economies, because the staffs were already much depleted.

Chester Gas Company's Profit-Sharing Scheme.—The Profit-Sharing Committee of the Chester United Gas Company, in their report for the past twelve months, say that on June 30, 1914, the price of gas was 2s. 6d. per 1000 cubic feet, at which rate profit-sharing employees were entitled under the regular scale to a bonus of 7½ per cent. on their salaries or wages; but the Directors found it necessary to increase the price of gas from March 18 last to 2s. 11d.; and at this price the bonus to which the employees were entitled under the scale was only 5 per cent. In accordance with the recommendation conveyed in the last report, employees who signed profit-sharing agreements for the current year waived the right of bonus according to the profit-sharing scale and rules; and it is therefore gratifying to the Committee to report that, while the Directors have expressed their appreciation of the confidence thus displayed in them by the employees, they have allowed the bonus to be declared at the rate of 6½ per cent., which is at the full rate provided under the profit-sharing scheme. The Directors have granted to those profit-sharing employees who are serving in His Majesty's forces a bonus on the same basis as if they had continued in their ordinary employment in the Company's service. Withdrawals during the past year have been heavy; and it is hoped there will be a marked change in this respect during the coming twelve months. During the past year employees have taken up a further sum of £280 of the Company's ordinary stock, making an aggregate sum of £2130 of stock purchased by them under the scheme.

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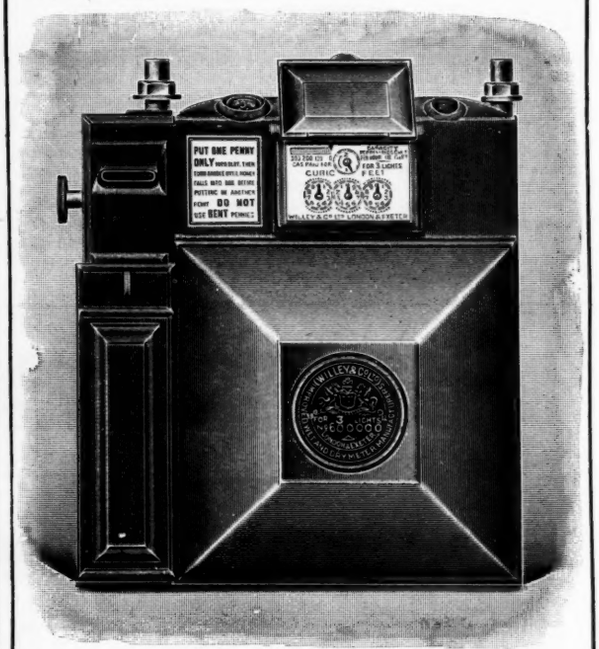

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Price of Gas at Pontefract.—The Pontefract Town Council last Wednesday decided to advance the price of gas 3d. per 1000 cubic feet; the new charge being 3s. 2d.

Lurgan Gas-Works Purchase Postponed.—At the last meeting of the Lurgan Urban Council, the Chairman intimated that the Treasury had withheld consent to the Council borrowing £50,000 for the purchase of the gas-works, which were to have been taken over on the 1st inst. by the Council. Arrangements were accordingly being made with the Directors of the Gas Company to continue operating the works for the present.

Darlington Gas-Works Accounts.—The working statement of the Darlington Gas Department for the year ended March 31 last shows that from 38,065 tons of coal, 433,246,000 cubic feet of gas were made, or 11,381 feet per ton of coal. The proportion of unaccounted-for gas was 4·75 per cent. The net cost of gas per 1000 cubic feet sold was 1s. 5·365d.; and a gross profit resulted from the year's operations of £14,532, or 6·43 per cent. upon the total capital employed. Private consumers (numbering 15,114) took 95·25 per cent. of the total quantity of gas sold. Coke and breeze saleable amounted to 9·8 cwt. per ton of coal carbonized.

To Economize in the Use of Coal.—The Parliamentary War Savings Committee have prepared a leaflet, entitled "Save Your Coal," containing twelve hints, among which are the following: Use gas coke wherever possible instead of coal. Coke made in coke-ovens is not suitable for house-fire purposes. Coal and coke mixed in equal proportions give a fuel which will last longer than coal alone. The more coke is used, the greater will be the production of the bye-products which are required for making explosives for the army and navy. Use gas whenever possible for cooking purposes, and turn it off when done with. By using gas, you economize in coal, and at the same time are assisting in the further production of bye-products in the gas-works which are necessary for the production of certain explosives now largely being used in the war.

Wages Questions at Wallasey.—Discussion took place in the Wallasey Town Council last Thursday, regarding proposed increases of wages in the Gas Department. In the first place, a recommendation of the Gas and Water Committee to give the lamplighters of the town an increase of 1s. per week was referred back for further consideration. Another proposal of the Committee was that the wages of the men at the gas-works should be increased so as to put them on the basis of the Birkenhead men, as fixed by a recent award—the proposed increase representing a total of about £600 per annum. It was moved that the consideration of this matter be deferred for twelve months, on the ground that many of the employees "were not making any sacrifices in regard to the war, and were better off than numerous other people, as they did not pay income-tax and had no position to keep up." It was pointed out that the increases were recommended after full consideration by the Committee; and the Council agreed to them—only three votes being recorded for the amendment.

Ilkeston Gas Charges.—At last Tuesday's meeting of the Ilkeston Town Council, Mr. W. Smith, in accordance with notice, moved that the question of the methods adopted in the collection of gas charges, since the price was recently advanced, should be referred to the Gas Committee for consideration and report. He alleged that an attempt had been made to charge the increased price to some consumers for the quarter previous to that for which the increase was determined upon; and that since this date some had been charged the enhanced rate for half the quarter only, while others, including some members of the Council, had been charged the old rate for the full quarter. The Mayor (Mr. T. A. Macdonald), who is Chairman of the Gas Committee, stated that only one complaint had been made at the office; and it had been found that there was no justification even for this. The Committee were quite willing to accept Mr. Smith's resolution. Nothing of a deceptive or underhand character had been done in dealing with those who used slot-meters; and no complaint had been made to him. The resolution was adopted.

GAS COMPANIES IN THE STOCK EXCHANGE.

Business last week on the Stock Exchange was quite upon what has now become the normal standard of quietude; but, taken on the whole, the ruling tone was agreeably firm. It is true that a temporary check was administered in the middle of the week by the dramatic and unexpected Greek crisis; but a quick recovery supervened and established an improvement, which bore eloquent testimony to the calm strength of the markets. A very gratifying feature was the increasing firmness of the War Loan, the popular demand for which was most marked. Colonial issues maintained their strength; and here the assured fine harvest of Canada, and the bright prospects of the Australian yield, lent potent support. The American was another good market; and Japanese was a bright point in the Foreign. Dulness prevailed in our much-tried Home Rails, and South Africans were easier; while movements varied in the Miscellaneous category. Glancing at our friend the enemy's financial affairs, it may be noted that in New York the German War Loan was being offered at a 7 per cent. price—an awkward come-down after all the cock-crowing in Berlin. In regard to our minimum prices, urgent request for some reduction continues; and it is likely that something in this line may be done. Some disappointment was manifested at the passing of an interim dividend by the Stock Exchange Managers; but looking at the serious reduction of revenue, it is difficult to blame them. Business in the Gas Market fell away considerably in point of volume—only seven undertakings were dealt in at all. As a general rule, prices were unchanged. The Money Market was easier.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 77⅜, 78½, Primitiva 2½, South Metropolitan 76⅜, 77¼, 77½. On Tuesday, Primitiva 2, ditto preference 3 5/16, 3⅜, South Metropolitan 77¼. On Wednesday, not a single bargain was marked. On Thursday, British 36⅝, 37, South Metropolitan, 77¼, 77½. On Friday, Alliance and Dublin debenture 69½, Brentford "B" 85½, 86, Gas Light ordinary 78, 78⅛, Primitiva preference 3⅜, 3 15/16, South Metropolitan 76⅜, 76½, 77, 77¼, South African, £8 4s.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING OCT. 9.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
874,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	69½
280,000	5	April 29	7½	Bombay, Ltd.	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bourne-mouth Gas and Water — 10 p.c.	29—30	5 6 8	..
878,480	10	,,	7	Bourne-mouth Gas and Water — B 7 p.c.	15—15½	4 10 4	..
95,000	10	,,	6	Bourne-mouth Gas and Water — Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Bourne-mouth Gas and Water — Deb.	.. —	..	..
880,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
830,000	,,	,,	11	Do. New	204—209	5 5 8	85½—86
50,000	,,	,,	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91—98	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,300	,,	,,	8	Do. A Ord. Stk.	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	36⅞—37
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1¼—2¼	—	..
100,000	10	—	—	Do. 4½ p.c. Pref.	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	103—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
560,000	,,	,,	5½	Do. 3½ p.c. do.	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 8 11	..
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	.. —	—	..
492,270	Stk.	—	6	Derby Con. Stk.	123—125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd.	17½—18	5 11 1	..
16,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke — 4 p.c. Ord.	98—102	4 15 6	77½—78½
2,600,000	,,	,,	3½	Gas Light and Coke — 3½ p.c. max.	76—79	4 8 7	..
4,062,235	,,	,,	4	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	4 0 10	..
4,674,850	,,	June 11	3	Gas Light and Coke — 3 p.c. Con. Deb.	73½—74½	4 0 6	..
130,000	,,	,,	10	Gas Light and Coke — 10 p.c. Bonds	.. —	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c.	.. —	—	..
131,000	Stk.	Mar. 12	7/8	Ilford A and C	151—154	5 2 4	..
65,780	,,	,,	6⅝	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental	150—160	5 12 6	..
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. — A	211—213	4 13 11	..
718,100	,,	,,	7	Liverpool 5 p.c. Ord. — B	146—14	4 14 7	..
806,089	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	.. —	—	..

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
75,000	5	June 11	6	Malta & Mediterranean	4¼—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne — 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd.	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98⅞—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—16	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd.	7½—7⅝	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B	128—131	4 19 8	..
100,000	50	,,	12	Do. C	118—121	4 19 2	..
52,000	50	,,	10	Do. D	.. —	—	..
249,980	5	April 29	5	Primitiva Ord.	5½—6	6 18 4	2—2⅛
499,960	5	June 26	5	,, 5 p.c. Pref.	4⅝—5	5 0 0	3 5/16—3 7/16
521,600	100	June 2	4	,, 4 p.c. Deb.	91—98	4 6 0	..
—	—	—	—	,, ,, 1911	.. —	—	..
846,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo — 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	San Paulo — 5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	233—234	4 9 8	..
209,984	,,	,,	10	Do. B	232—234	4 9 8	..
523,500	,,	,,	10	Do. C	230—232	4 10 1	..
90,000	10	May 28	9	South African	10½—11½	7 16 6	8/4/0
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	76⅛—77⅛
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 8 5	..
60,000	,,	,,	5	Do. 5 p.c. Pref.	110—112	4 9 8	..
—	—	,,	—	Do. West Kent.	.. —	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord.	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½	Tottenham and District — A 5 p.c.	135—138	5 8 8	..
742,275	,,	,,	6	Tottenham and District — B 3½ p.c.	115—117	5 2 7	..
181,255	,,	June 26	4	Tottenham and District — 4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
30,000	Stk.	Feb. 26	8⅜	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134	5 4 7	..
108,075	,,	,,	5/17/8	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6½	Wimbledon 5 p.c.	117—122	5 0 5	..
98,000	,,	,,	6⅝	Epsom 5 p.c.	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66—69	4 6 11	..

Mr. Walter Hoe, late Manager for the Ecliptic Gas Light Company, of Nuneaton, has been appointed Northern Representative for Messrs. Arden Hill and Co., of Birmingham.

Mr. Baldwin Latham, the Engineer to the Abertillery and district water-works, now under construction, in the course of a report, comments upon the continuous delay in the carrying out of the contracts, and says that, in order to attract more labour, higher wages and a bonus should be offered.

On retiring through ill-health from the position of foreman, after 38 years' service with the West Bromwich Corporation Gas Department, Mr. G. Lines has been presented with an armchair, subscribed for by the staff and the men at the works. Mr. W. H. Johns (the Engineer), in making the presentation, referred to the highly satisfactory manner in which Mr. Lines had carried out his duties during his whole career at the works.

Holophane Limited have just issued a new illustrated handbook, comprising a series of reproductions of photographs of actual lighting installations made with their system of illumination. The book is divided into sections according to the class of building dealt with; and its object is to show that the Holophane system is capable of being adapted to any kind of building or style of architecture. In glancing through the book, one of the photographs noticed is of the Board-room of the South Metropolitan Gas Company. It is pointed out that, although Holophane glassware is often chosen on account of its scientific design, and because of the economies it achieves, the appearance of the units is also an important consideration. In the lighting of fine interiors, it is, of course, necessary to select fittings and glassware which harmonize with the general scheme of decoration, and have a dignified and impressive appearance. Its qualities in this respect have led to Holophane glassware being widely used in many important public buildings and interiors of architectural distinction.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

FITTERS. No. 6106.
ASSISTANT SUPERINTENDENT. No. 6105.
TESTERS (Gas-Fires, &c.). No. 6107.
ENGINEER. South-West Suburban Water Company. Applications by Oct. 20.

Appointments Vacant *(continued)*—
GENERAL WORKS FOREMAN AND OUTDOOR FOREMAN. Stockton-on-Tees Gas Department. Applications by Oct. 19.

Appointment Wanted.
CLERK AND COLLECTOR. No. 6108.

Process Wanted.
NAPHTHALENE SEPARATION AND REFINING. No. 6104.

Plant, &c., for Sale.
CAST IRON LAMP STANDARDS. Glastonbury Gas-Works.

TENDERS FOR

Fire-Clay Goods.
SHEFFIELD GASLIGHT COMPANY. Tenders by Nov. 2.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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